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Baseline Radiological Survey of the Sodium Disposal Facility (T886)

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Baseline beta/gamma radiological survey at the Sodium Disposal Facility (T886) site. The average ambient gamma exposure level at one meter height above the surface was found to be 13.8 uR/Hr.

The survey found elevated gamma activity at five locations in the Lower Pond Basin. One location measured 27.5 uR/hr, indicating the presence of radioisotope contamination in that area. The other four locations were marginally above background. The five locations in the lower pond basin describe a crescent-shaped area occupying about 1000 square feet.

One location in the Upper Pond Basin had a marginally elevated beta reading.

The measurements over the rest of the SDF site revealed normal background radiation levels, statistically indistinguishable from uncontaminated soil and rocks in the surrounding region.

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## 1. Introduction:

This report documents the beta/gamma radiological survey of the Sodium Disposal Facility (SDF), and analysis of the data therefrom. The survey was undertaken to determine the site baseline radiological condition in preparation for site remediation. The procedures governing the conduct of this survey are described in reference 1. An amended (red-lined) copy of the procedure has been prepared to reflect a few changes that were found to be needed during the survey. The amended version will be published as Revision A of the original.

## 2. Summary of Results:

Beta and Gamma activity measurements were made at 812 survey points across the canyon where the two acre SDF site is located. The data from the survey has been statistically analyzed, and the results of the analysis for the total survey are summarized in Table 1. The average ambient gamma exposure level for the site, at one meter height above the surface, was found to be 13.8 uR/hr.

Table 1: TOTAL SDF BASELINE SURVEY RESULTS

	AVG GAMMA @ 1-m (cpm)	AVG BETA @ 1-cm (dpm)	AVG GAMMA EXPSR (uR/hr)	AVG BETA (dpm/100cm2)
median =	2966	841	13.8	4,207
mean =	2996	840	13.9	4,200
sdev =	225	111	1.0	555
max =	5914	1,243	27.5	6,215
min =	2097	465	9.8	2,325
n =	812	811	812	811
	-----	-----	-----	-----
Bkgd =	2966	841	13.8	4,207
ssa based on total	+ 523	+ 258	+ 2.4	+ 1,291
sdf survey data:	3489	1,099	16.2	5,498

Table 1. Statistical Summary of SDF Baseline Survey Results.

It should be noted that this survey provides data to evaluate the likely presence of radioactive contaminants at or near the soil surface, but does not provide data about the presence or amount of radioactive contaminants below the surface. Data for evaluating radiation contaminant conditions beneath the surface must be developed from the analysis of core samples, and from radiation monitoring performed during excavation.

Seventeen survey measurement locations were found to have statistically significant<sup>1</sup> near-surface radioactivity levels. Of these, only one area of the SDF site can be said to be unambiguously radioactively contaminated<sup>2</sup>. The statistically significant levels found in the other SDF areas are all at marginally elevated activity<sup>3</sup> levels, and therefore those sites must be further evaluated by soil sample analysis to determine if they are actually contaminated.

The SDF site locations having elevated radioactivity levels are listed in Table 2.

Table 2: SDF Locations with Activity Levels that Equal or Exceed SSA.

SDF AREA	N/S COORD	WEST D COORD	AVG GAMMA @ 1-m (cpm)	AVG BETA @ 1-cm (dpm)	AVG GAMMA EXPOSURE (uR/Hr)	AVG BETA (dpm/100cm2)
NW	120 N	217 W	3954 !	866	18.4 !	4,331
NW	120 N	210 W	3484 !	923	16.2 !	4,613
NW	110 N	220 W	3685 !	862	17.1 !	4,311
NW	100 N	230 W	3650 !	943	17.0 !	4,714
LP	0 N	170 W	3743 !	1022	17.4 !	5,112
LP	20 S	180 W	3512 !	874	16.3 !	4,369
LP	30 S	180 W *	5914 !	1243 !	27.5 !	6,215 !
LP	40 S	150 W	3576 !	1054	16.6 !	5,271
LP	50 S	130 W *	3494 !	899	16.2 !	4,433
W	30 S	330 W	3517 !	798	16.3 !	3,992
W	70 S	390 W	3831 !	944	17.8 !	4,719
W	70 S	380 W	3483 !	892	16.2 !	4,461
W	80 S	390 W	3753 !	726	17.4 !	3,630
W	90 S	390 W	3496 !	804	16.2 !	4,022
W	100 S	400 W	3743 !	835	17.4 !	4,177
W	110 S	400 W	3517 !	940	16.3 !	4,698
UP	100 S	110 W	3058	1105 !	14.2	5,526 !

notes: Values are average of all measurements at each location.  
symbols: \* Indicates average of more than one set of paired data.  
! Indicates value equals or exceeds ssa.

Table 2. List of SDF Locations with Statistically Significant Activity Levels.

<sup>1</sup>"Statistically significant activity" (ssa) is defined as a radioactivity level that is equal to or greater than ninety-five percent of the values expected from a normal distribution of measurements of background radioactivity for the surrounding uncontaminated area.

<sup>2</sup> "radioactive contamination" is defined as exceeding the normal ambient gamma radioactivity level at one meter height by more than 5 uR/hr -- the criteria limit for this project.

<sup>3</sup>"marginally elevated activity" is defined as a radioactivity level that is higher than the statistically significant activity (ssa) limit, but still within the upper five percent of the statistical range of normal background radiation.

As can be seen in the table, five locations in the Lower Pond Basin had elevated gamma activity, and one of these locations measured 27.5 uR/hr, clearly indicating the presence of radioactive contamination in that area.

One location in the Upper Pond Basin was found to have a marginally elevated beta activity without an accompanying elevation in gamma activity. Because this location is adjacent to the boundry of the Lower Pond Basin, it will be tentatively assumed that this measurement indicates the presence of at least some contaminants in the Upper Pond Basin.

The other eleven scattered locations that were found to have marginally elevated gamma activity levels were all adjacent to Chatsworth geological formation. These nearby siltstone rock formations are known to have a higher natural radioactivity level than the alluvium that predominates in the SDF site (reference 3).

Thus, except for the contaminated locations in the Upper and Lower Pond Basins, the survey data were statistically within the range of normal background radiation levels observed in naturally occurring, uncontaminated soil and rocks in the surrounding region. Nevertheless, all of the locations in Table 2 should be considered candidates for additional soil sample analysis.

The data supports the continued designation of the Upper and Lower Pond Areas as Radiological Material Management Areas (RMMAs). Since the results of this survey agree with the results of previous surveys at this site (reference 2), and no evidence was found in the surface beta and ambient gamma data of this survey to indicate that migration of radioactive cantaminants has occurred, the areas outside the two pond basins need not be designated as RMMAs at this time. If further soil sampling or field surveys in the other areas reveal the presence of radioactive contamination, then the status of these other areas, or subsets of areas may require reconsideration.

Excavation or material removal in the areas outside of the two pond basins should be regularly monitored by the site RP&HPS technician to assure that no previously undetected radioactive materials are being uncovered. Likewise, all excavated area bottoms and the dirt being used for backfill should be surveyed before the excavated areas are refilled.

All of the raw data, spreadsheet tables from the data analysis, maps, field notebook and other supporting material for this survey will be kept in the T886 file at RP&HPS, Bldg 100.



### 3. Identification of Facility:

The Sodium Disposal Facility (SDF) is located at the west end of Rockwell International's Santa Susana Field Laboratory (SSFL). The SDF is commonly called the "Old Sodium Burn Pit", and is designated as SSFL site T886. The facility occupies the high ground of an alluvial flat that is roughly triangular in shape, and about two acres in area. The site is bordered by siltstone formations on two sides, which come together at the north end of the site to form a blunted apex to the triangle. Site drainage is through the siltstone narrows at this apex. The location of the SDF site within SSFL Area IV is mapped in Figure 1.

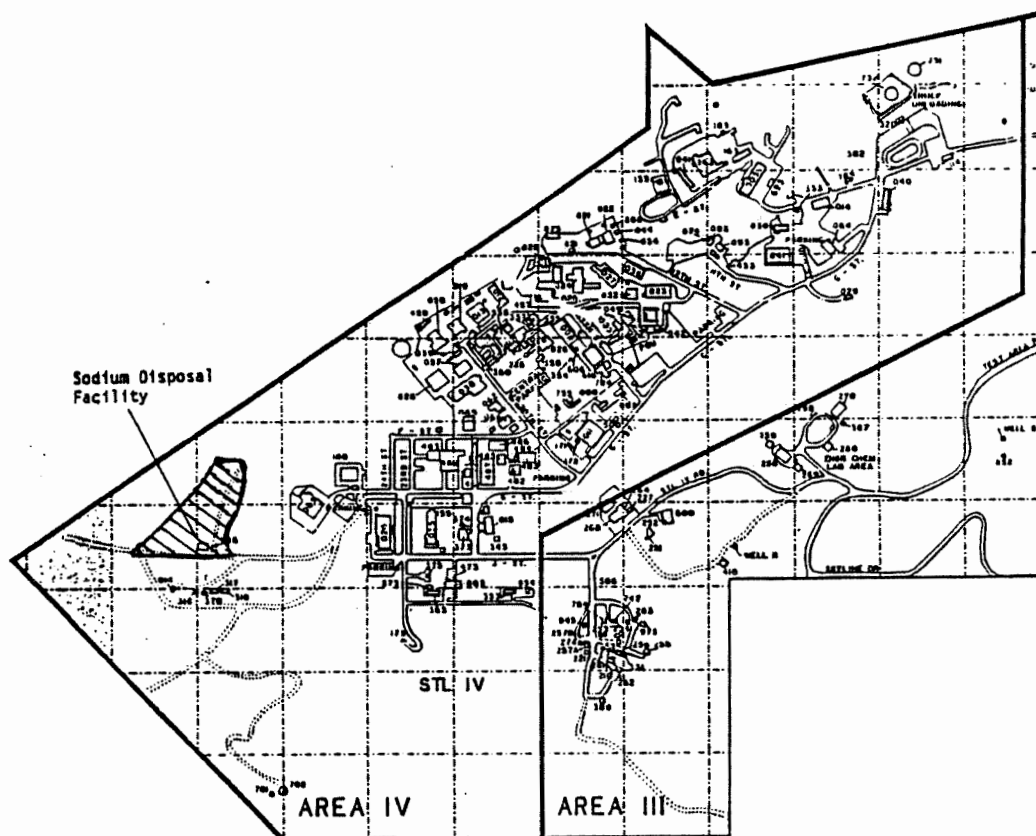


Figure 1. SSFL Area IV map showing location of the SDF site.

The SDF was once used as a disposal site for sodium and sodium-potassium alloys, and combustible materials from US DOE/AEC nuclear programs. The disposal activity was mostly confined to a concrete pool, and two open-field pits that are referred to as the Upper Pond Basin and the Lower Pond Basin. Previous radiological survey and decontamination work have been done at the site. A more detailed description of the site's physical location, its relevant operational history, and a discussion of previous survey and decontamination efforts can be found in reference 2.

#### 4. Survey Scope:

The radiological survey of this report was done to establish the baseline ambient radiation levels across the entire SDF site in preparation for site remediation. The data from the survey are intended to be used to identify areas where radioactivity exists at levels above normal background. The survey included measurements of ambient gamma radiation at 1-m height above the ground, and pancake-GM measurements of the soil surface activity at 1-cm above the ground. The pancake-GM detectors are primarily sensitive to beta radiation, which was the intended use, but also have lessened sensitivity to gamma and alpha radiation. For purposes of this report, total activity measured by the pancake-GM detectors will be referred to as "beta" activity.

#### 5. Survey Procedures:

The survey procedures are detailed in reference 1, as amended in the field. Where it was necessary to change the original procedures, red-line notations were made on a control document. The changed procedure document will be published as Revision A to the original. What follows is a brief description of the SDF baseline survey procedures.

Prior to the start of the survey, the SDF site was overlaid by a 10-ft interval, North/South, East/West grid. Wood stakes were set at the intersection of the grid lines, and survey measurements were made at the location of the stakes. Where stake-points were lost or obliterated, the intersect locations were recreated using measuring tapes. For analysis of the data, the facility was further sectioned into natural physical areas -- Lower Pond Basin, Upper Pond Basin, West Area, Northwest Area, Northeast Area, and East Area. The locations of these areas within the site are illustrated in Figure 2.

The survey consisted of measurements of detected activity counts during a 1-minute time interval. All measurements were made with paired sets of independent survey instruments -- two 1-inch NaI gamma detectors at 1-m height, and two pancake-GM beta detectors at 1-cm from the ground surface. To insure precision in reproducing the 1-m height at each location, the two gamma detectors were mounted on a fixture made from a pvc pole and assorted pvc fittings. Likewise, the pancake-GM detectors were individually fitted with pvc collars that lifted the detectors 1-cm above the surface, with a lead weight attached to each detector backside to hold them firmly in place. Details about the fixtures can be found in reference 1.

During the survey, the readings from the independent instrument pairs were compared for consistency and reasonableness. Anomalous or disparate readings at any time caused the survey team

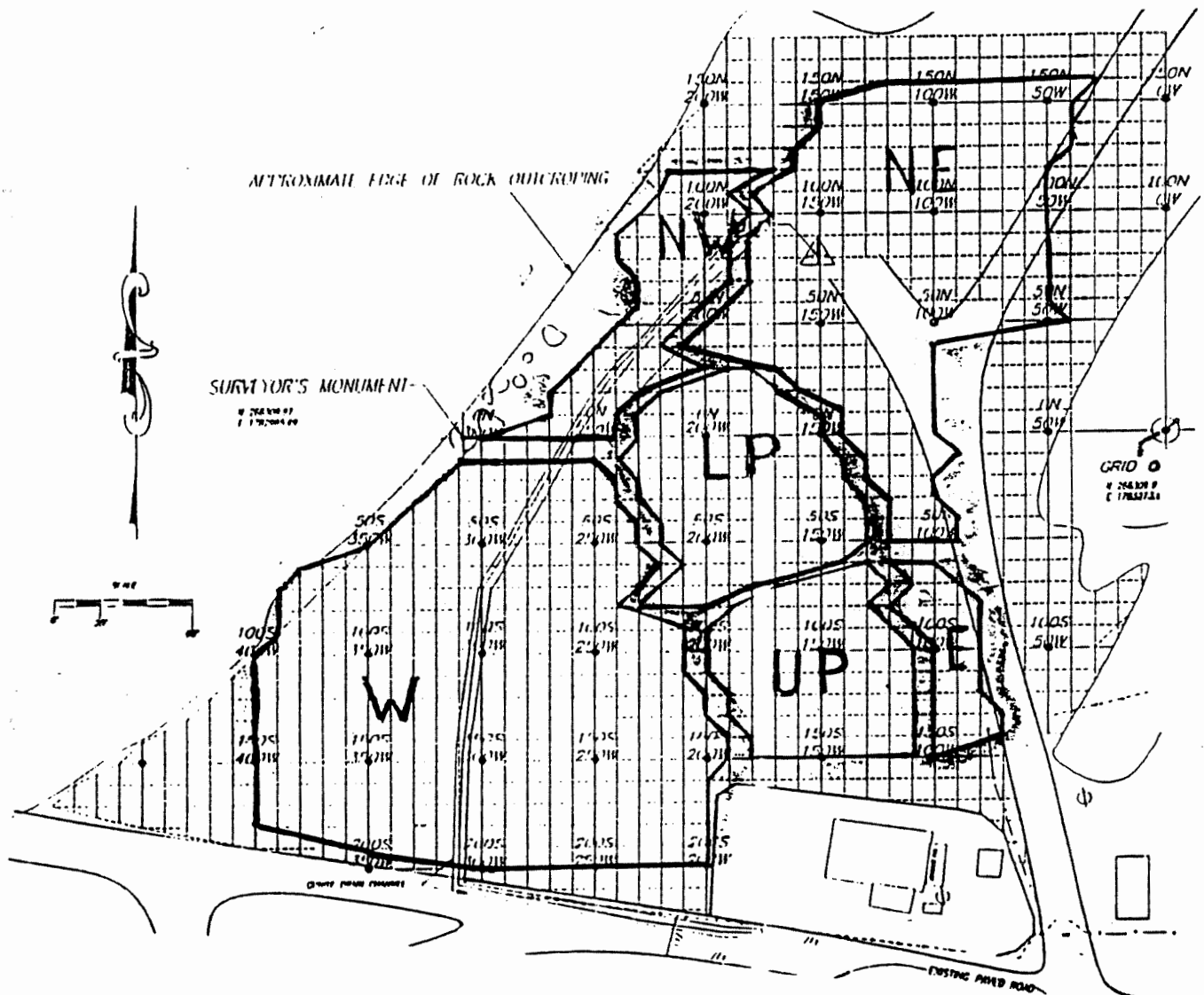


Figure 2. SDF Site Map Showing Area Subdivisions.

to momentarily interrupt the survey to check for instrument malfunctions (especially cable problems), and to retake the measurements. Several such problems were encountered during the survey. All of the data from each location were ultimately used in the analysis of the survey results. A single gamma, and a single beta activity measurement for each location was determined finally as the average of all of the measurements from each set of paired instruments, although all of the individual measurements were recorded and analyzed separately.

All data were recorded on designated data record sheets by site location coordinates. Time and date were also recorded, along with notes about the character of the location (ie: "on top of

Berm", "on road fill", "location of drain ditch", "in lower pond", etc); notes about the measurement environment (ie: "on grass", "on imported road dirt", "cement", "near rock cliff", etc.); and notes about instrument behavior (ie: "wide range between readings", "reading very sensitive to location", etc).

Instrument performance was monitored throughout the survey by regular checks at a designated location in a canyon isolated from, but near the SDF site. With reference to the SDF Site coordinate system, the instrument performance checks were done at location (103S, 52E). The performance checks included measuring the instrument response to the ambient background radiation level at the check location, and measuring the instrument response to a low-level check source. The activity of the check sources were chosen to test instrument response near the anticipated statistically significant activity (ssa) level. The checksources each consisted of Marinelli beakers filled with reagent grade KCl salt. The two checksources were mounted in a fixture made from pvc pipe fittings, which allowed the detectors to be checked without removing them from their survey fixtures. The design allowed one gamma detector and one beta detector to be associated with each checksource in a rigid fixture, and all instruments could be checked simultaneously.

Specific details about the instrument checksources, and the hardware used for the performance checks are given in reference 1.

## 6. DATA ANALYSIS:

All of the data were entered into a database (Microsoft Works), and normalized for detector efficiency factors and geometry. Statistical analysis was then performed on the data using Lotus (ver 2.01) spreadsheets. The data were first evaluated for measurement agreement between paired instruments, then inspected for reasonableness, and for the presence of outliers. The distribution of the data was compared to Gaussian normal distribution on a computer analysis program (RDSRVY) developed by the RP&HPS group. The resulting plots (Figures 3 & 4) were inspected for features that might indicate the presence of non-normal data distribution (ie: measurements that are biased due to systematic or sensitivity errors, or due to the presence of contamination).

The natural ambient gamma background activity value for the site was determined by compiling together all of the gamma data from both gamma instruments from the entire survey, ranking the data by amplitude, and selecting the median value. It was felt that, given the large amount of data collected during the survey, this method would be the least susceptible to perturbation by data extremes at either end of the range, and would thus produce the most accurate estimate of the average value. The data from the beta instruments was similarly treated.

This method produced an estimate of the natural background radioactivity for ambient gamma (2966 cpm), and for surface beta (4207 dpm/100cm<sup>2</sup>) that were clearly representative for the area.

With the large database from the whole site (most of which is known to be uncontaminated from previous surveys), it was decided that the most representative estimate of the statistically significant activity (ssa) level for the survey would be best obtained by using the actual standard deviation for the total set of data in the calculation. Recall that the ssa is the activity level at which there is a 95% probability that the data is not part of the normal scatter in background readings, and thus represents a possible detection of the presence of contamination. Note also that there is a 5% probability that this same measured activity level IS part of the normal scatter in background radiation.

Finally, the mean value for the data was calculated so that it could be compared to the median value. A large disagreement between these two values would be a possible indicator that there are extremes of data in the data set, or that a portion of the data might be distributed differently than the Gaussian normal distribution (a possible indicator of low-level contamination).

This statistical analysis was performed for the total data set for each instrument, and for the combined (averaged) data for each location. The data were then sorted by SDF area location, and a similar statistical analysis was performed for each area. Seperate ssa values were also calculated from each area 's subset of data so that the results from each area could be compared to the results from the whole site.

## 7. SURVEY RESULTS:

A statistical summary of the overall results of the SDF survey was presented in Table 1, and a list of all of the SDF locations with statistically significant activity was presented in Table 2, both in section 2 of this report. The averaged radioactivity levels for each location on the 10-ft survey grid in each of the SDF areas are tabulated by area in the tables that follow in this section.

The tables present the data in coordinate-location format, with all of the coordinates referring to distance (in feet) from the site reference surveyor's brass monument:

point 0,0 = location	N 266,309.97 ft	California State
	-----	Coordinate
	E 1,783,273.69 ft	System

For most locations, the listings show the average of a single set of paired instrument readings. An asterisk (\*) after the location coordinate indicates that the values given are averaged from multiple sets of measurements -- at least two sets of paired instrument readings. An exclamation point (!) after any of the measurement values indicates that it equals or exceeds the statistically significant activity level. Eight of the survey grid points fell along the site's cement diversion drainage channel (which serves to keep upslope water runoff from running onto the pond areas), and these locations were indicated by a letter "d". Also, five locations in the Northeast Area (indicated by the notation "obs") were obstructed by large utility bins, and thus could not be directly surveyed (the perimeter of each of the bins was checked, and determined to be indistinguishable from the rest of the area's measurement population, however). Recall that the site background radioactivity level (BkGd) and ssa are calculated from the total survey data set. For each area, ssa values have also been calculated from just the area data, and these values, along with a statistical summary of the data are presented so that the radiological character of each area can be compared as a whole to other areas, and to normal background distributions.

The data are also presented in the format of individual area maps, to show the distribution of radioactivity levels across the site, and to show the locations that equal or exceed ssa.

**7.1. Overall Survey Data Distribution:** The distribution of the data from the entire SDF survey were plotted on a probability scale against a Gaussian cumulative distribution function using a radiation survey analysis program (RDSURVY). The result of this analysis are shown in Figure 3, for gamma exposure, and Figure 4, for beta activity.

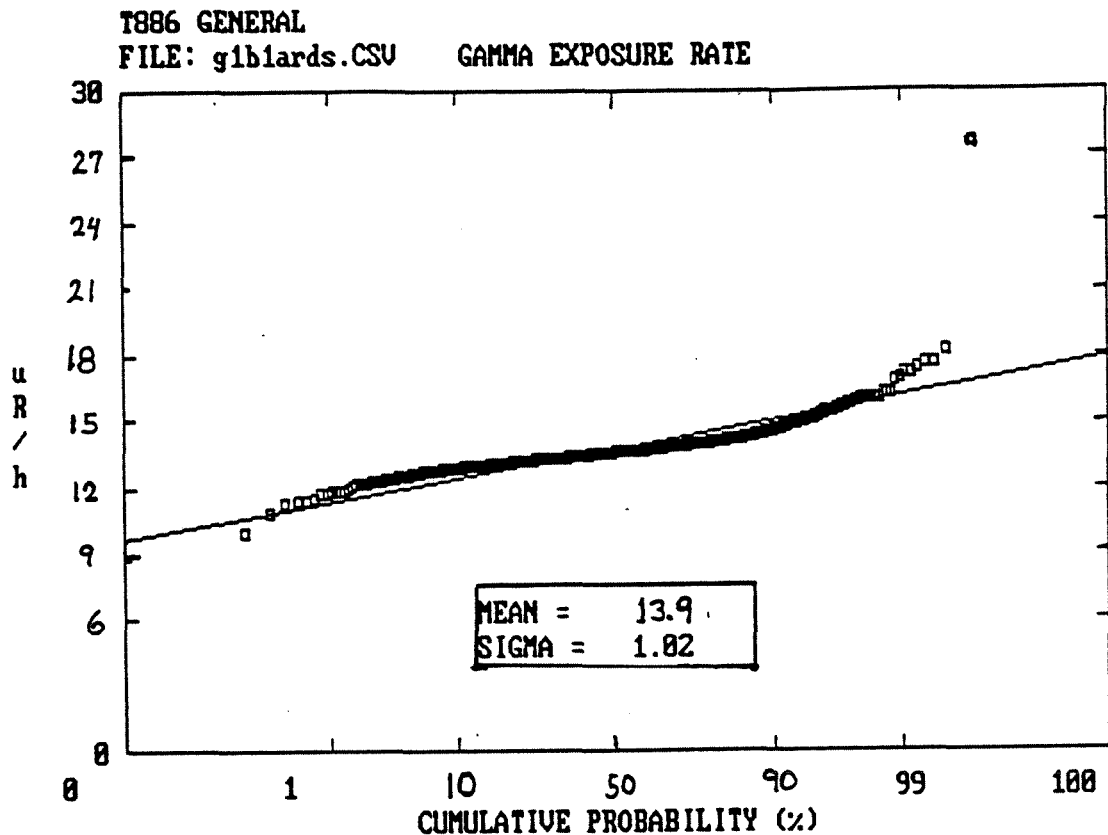


Figure 3. Cumulative Probability Plot of Gamma Data vs. Gaussian Normal Distribution.

Figure 3 shows that the 1-m height gamma exposure data contains a high reading (from the lower pond area) that stands out from the main body of data as probable contamination. A small cluster of slightly high readings that branch off at the top end of the distribution curve all come from measurements in close proximity to the siltstone rock formations. These formations contain mineral uranium and thus have a higher natural radioactivity level than the loose soil which covers most of the SDF site (reference 3). The main body of exposure data falls closely along the Gaussian distribution curve, which means they are distributed approximately as one would expect from normal background radiation.



T886 GENERAL  
FILE: B1ARDS.CSV TOTAL BETA ACTIVITY

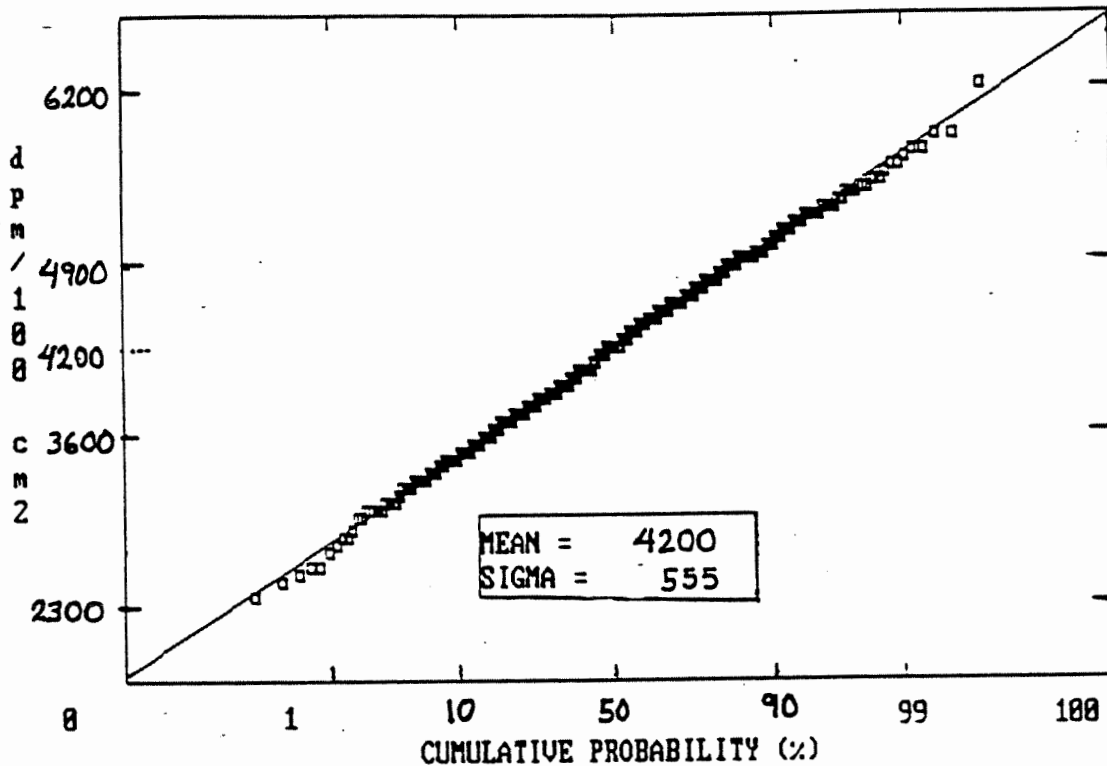


Figure 4. Cumulative Probability Plot of "Beta" Data vs. Gaussian Normal Distribution.

Figure 4 shows that the pancake-GM beta activity readings are also closely distributed along the Gaussian distribution curve, which means they are distributed approximately like one would expect from normal background radiation. There are no unusually high readings, although there is one outlier from the Lower Pond Basin that corresponds to the contaminated location registered in the gamma data. The other site location having a surface beta activity near ssa, in the Upper Pond Basin, appears at the high end of Gaussian normal distribution in this plot, and is thus ambiguous as an indicator of contamination.

**7.2. Lower Pond Basin:** A statistical summary of the Lower Pond Basin survey results are presented in Table 3-1. SSA values have been estimated from the Lower Pond Basin data so the area data can be compared to the ssa values determined for the overall SDF site.

The averaged radiation levels at each location on the sample grid in the Lower Pond Basin are presented in Table 3-2. The radiation levels for each 10-ft grid interval are shown in map format in Figure 5 (Gamma Activity), Figure 6 (Gamma Exposure), and Figure 7 (Beta Activity). The survey found five locations in the Lower Pond Basin having statistically significant radioactivity levels. These locations are mapped in Figures 8 (Gamma Exposure), & 9 (Beta Activity).

One of the locations measured about twice normal background (27.5 uR/hr) for gamma, and substantially elevated above background (6215 dpm/100cm<sup>2</sup>) for surface beta; for both gamma and beta, these were the highest readings recorded during the SDF survey. The other four locations in this area measured gamma activity levels just marginally above the normal background.

Additional topological renderings of the exposure data are presented in isocontour format in Figures 10 & 11. Figure 10 presents the gamma exposure data expressed as an isocontour relief topography shown in isometric view. This format emphasizes the physical distribution of the contaminated area. Figure 11 presents the gamma exposure data as an isocontour map shown in plan view.

		AVG GAMMA @ 1-m(cpm)	AVG BETA @ 1-cm(dpm)	AVG GAMMA EXPSR (uR/hr)	AVG BETA (dpm/100cm <sup>2</sup> )
LOWER POND AREA SUMMARY	median	= 3006	809	14.0	4050
	mean	= 3101	837	14.4	4168
	sdev	= 338	114	1.6	552
	max	= 5914	1243	27.5	6215
	min	= 2864	602	13.3	3009
	n	= 95	95	95	95
ssa based		3006	809	14.0	4050
on lower pond		+ 786	+ 265	+ 3.7	+ 1284
area data:		= 3792	1074	17.7	5334
ssa based		Bkgd = 2966	841	13.8	4207
on total		+ 523	+ 294	+ 2.4	+ 1291
survey data:		= 3489	1181	16.2	5498

Table 3-1. Statistical Summary of Lower Pond Basin Survey Results.

Table 3-2. SDF Lower Pond Basin: Averaged Radiation Levels at Each Location on the 10-ft Sample Grid.

LOWER POND BASIN area: Averaged Rad Level at Each Location							LOWER POND BASIN area: Averaged Rad Level at Each Location						
AREA	NORTH COORD	WEST COORD	AVG GAMMA @ 1-m(cpm)	AVG BETA @ 1-cm(dpm)	AVG GAMMA EXPSR (uR/Hr)	AVG BETA (DPH/100CH2)	AREA	NORTH COORD	WEST COORD	AVG GAMMA @ 1-m(cpm)	AVG BETA @ 1-cm(dpm)	AVG GAMMA EXPSR (uR/Hr)	AVG BETA (DPH/100CH2)
LP	30 N	190 W	2920	777	13.6	3887	LP	50 S	220 W	3017	764	14.0	3753
LP	30 N	180 W	2910	634	13.5	3169	LP	50 S	210 W	2928	700	13.6	3433
LP	20 N	220 W	2924	687	13.6	3435	LP	50 S	200 W	2964	783	13.8	4255
LP	20 N	210 W	2931	746	13.6	3732	LP	50 S	190 W	3037	981	14.1	4696
LP	20 N	200 W	2906	628	13.5	3142	LP	50 S	180 W	3089	996	14.4	4419
LP	20 N	190 W	2888	783	13.4	3915	LP	50 S	170 W	2997	927	13.9	4506
LP	20 N	180 W	3024	751	14.1	3753	LP	50 S	160 W	3089	1004	14.4	5383
LP	20 N	170 W	2918	820	13.6	4101	LP	50 S	150 W	3160	989	14.7	4541
LP	10 N	230 W	3088	804	14.3	4019	LP	50 S	140 W	3305	940	15.4	4574
LP	10 N	220 W	2956	857	13.7	4287	LP	50 S	130 W	3494	899	16.2	4433
LP	10 N	210 W	2984	756	13.9	3781	LP	60 S	210 W	3009	738	14.0	3691
LP	10 N	200 W	2922	645	13.6	3223	LP	60 S	200 W	3042	714	14.1	3571
LP	10 N	190 W	2958	777	13.7	3886	LP	60 S	190 W	3037	836	14.1	4179
LP	10 N	180 W	2959	655	13.7	3275	LP	60 S	180 W	3043	898	13.8	3647
LP	10 N	170 W	3185	1055	14.8	5273	LP	60 S	170 W	2961	729	13.9	4624
LP	10 N	160 W	3110	974	14.4	4872	LP	60 S	160 W	2983	925	14.6	4919
LP	10 N	150 W	3023	852	14.0	4259	LP	60 S	150 W	3149	984	14.6	4829
LP	0 N	230 W	3037	676	14.1	3382	LP	60 S	140 W	3133	966	13.5	4099
LP	0 N	220 W	2975	602	13.8	3009	LP	70 S	220 W	2898	820	14.5	3607
LP	0 N	210 W	2946	708	13.7	3538	LP	70 S	210 W	3121	721	14.3	3720
LP	0 N	200 W	3006	719	14.0	3595	LP	70 S	200 W	3075	744	13.3	3939
LP	0 N	190 W	2956	778	13.7	3891	LP	70 S	190 W	2864	788	13.6	4612
LP	0 N	180 W	3054	767	14.2	3833	LP	70 S	180 W	2869	727	13.5	4421
LP	0 N	170 W	3743	1022	17.4	5112	LP	80 S	230 W	2936	882	13.5	3675
LP	0 N	160 W	3315	836	15.4	4180	LP	80 S	220 W	2904	884	13.5	4124
LP	0 N	150 W	3116	1059	14.5	5294	LP	80 S	210 W	2904	735	13.5	4124
LP	10 S	240 W	2987	825	13.9	4127	---	---	---	---	---	---	---
LP	10 S	230 W	3039	756	14.1	3780							
LP	10 S	220 W	3016	810	14.0	4050							
LP	10 S	210 W	2939	788	13.7	3938							
LP	10 S	200 W	2996	660	13.9	3300							
LP	10 S	190 W	3117	778	14.5	3888							
LP	10 S	180 W	3322	809	15.4	4046							
LP	10 S	170 W	3322	836	15.4	4180							
LP	10 S	160 W	3276	1006	15.2	5031							
LP	10 S	150 W	3089	885	14.4	4423							
LP	10 S	140 W	2906	948	13.5	4740							
LP	20 S	230 W	2988	852	13.9	4260							
LP	20 S	220 W	2964	751	13.8	3754							
LP	20 S	210 W	3018	787	14.0	3937							
LP	20 S	200 W	2944	841	13.7	4207							
LP	20 S	190 W	3207	899	14.9	4497							
LP	20 S	180 W	3312	874	16.3	4369							
LP	20 S	170 W	3215	921	14.9	4606							
LP	20 S	160 W	3035	858	14.1	4290							
LP	20 S	150 W	2923	878	13.6	4392							
LP	20 S	140 W	3004	900	14.0	4501							
LP	30 S	230 W	2994	1066	13.9	5329							
LP	30 S	220 W	2983	858	13.9	4288							
LP	30 S	210 W	2994	799	13.9	3995							
LP	30 S	200 W	3104	847	14.4	4234							
LP	30 S	190 W	3394	900	15.8	4501							
LP	30 S	180 W	5914	1243	27.5	6215							
LP	30 S	170 W	3268	804	15.2	4022							
LP	30 S	160 W	3096	831	14.4	4154							
LP	30 S	150 W	3071	847	14.3	4235							
LP	30 S	140 W	3041	809	14.1	4045							
LP	30 S	130 W	3077	906	14.3	4529							
LP	40 S	220 W	2875	762	13.4	3808							
LP	40 S	210 W	2972	729	13.8	3647							
LP	40 S	200 W	2978	751	13.8	3755							
LP	40 S	190 W	3115	836	14.5	4179							
LP	40 S	180 W	3122	788	14.5	3939							
LP	40 S	170 W	3157	948	14.7	4738							
LP	40 S	160 W	3465	980	16.1	4396							
LP	40 S	150 W	3576	1054	16.6	5271							
LP	40 S	140 W	3454	949	16.0	4743							
LP	40 S	130 W	3464	873	16.1	4363							

Figure 5. Map of Lower Pond Ambient Gamma Activity.

LOWER POND BASIN: AMBIENT GAMMA ACTIVITY @ 1-m (avg cpm)													
west coordinate:													
	240	230	220	210	200	190	180	170	160	150	140	130	
	----	----	----	----	----	----	----	----	----	----	----	----	
north													
coordinate:	30					2920	2910						
	20		2924	2931	2906	2888	3024	2918					
	10	3088	2956	2984	2922	2958	2959	3185	3110	3023			
(-n = south)	0	3037	2975	2946	3006	2956	3054	3743	3315	3116			
	-10	2987	3039	3016	2939	2996	3117	3322	3322	3276	3089	2906	
	-20		2988	2964	3018	2944	3207	3512	3215	3035	2923	3004	
	-30		2994	2983	2994	3104	3394	5914	3268	3096	3071	3041	3077
	-40			2875	2972	2978	3115	3122	3157	3465	3576	3454	3464
	-50			3017	2928	2964	3037	3089	2997	3089	3160	3305	3494
	-60				3009	3042	3037	3043	2961	2983	3149	3133	
	-70			2898	3121	3075	2864	2869					
	-80	2936	2904	2904	2899								

LOWER POND BASIN				TOTAL SDF SURVEY			
1-m AMBIENT GAMMA				1-m AMBIENT GAMMA			
AVG CPM				AVG CPM			
-----				-----			
median	=	3006		BkGd = median	=	2966	
mean	=	3101		mean	=	2996	
sdev	=	338		sdev	=	225	
max	=	5914		max	=	5914	
min	=	2864	ssa = BkGd + (523)	min	=	2097	
n	=	95	* ssa = 3489 cpm	n	=	812	

\* note: Five locations with statistically significant gamma exposure were found in the lower pond area.

Figure 6. Map of Lower Pond Gamma Exposure.

LOWER POND BASIN: AMBIENT GAMMA EXPOSURE @ 1-m (uR/hr)											
west coordinate:											
	240	230	220	210	200	190	180	170	160	150	140
north coordinate:	30										
						13.6	13.5				
20			13.6	13.6	13.5	13.4	14.1	13.6			
10		14.3	13.7	13.9	13.6	13.7	13.7	14.8	14.4	14.0	
(-n = south) 0		14.1	13.8	13.7	14.0	13.7	14.2	17.4	15.4	14.5	
-10	13.9	14.1	14.0	13.7	13.9	14.5	15.4	15.4	15.2	14.4	13.5
-20		13.9	13.8	14.0	13.7	14.9	16.3	14.9	14.1	13.6	14.0
-30		13.9	13.9	13.9	14.4	15.8	27.5	15.2	14.4	14.3	14.1
-40			13.4	13.8	13.8	14.5	14.5	14.7	16.1	16.6	16.0
-50			14.0	13.6	13.8	14.1	14.4	13.9	14.4	14.7	15.4
-60				14.0	14.1	14.1	14.1	13.8	13.9	14.6	14.6
-70			13.5	14.5	14.3	13.3	13.3				
-80		13.6	13.5	13.5	13.5						

LOWER POND BASIN  
GAMMA EXPOSURE @ 1-m  
avg (uR/hr)

-----  
median = 14.0  
mean = 14.4  
sdev = 1.6  
max = 27.5  
min = 13.3  
n = 95

TOTAL SDF SURVEY  
GAMMA EXPOSURE @ 1-m  
avg (uR/hr)

-----  
Bkgd = median = 13.8  
mean = 13.9  
sdev = 1.0  
max = 27.5  
min = 9.8  
n = 872

ssa = Bkgd + (2.4)

\* ssa = 16.2 uR/hr

\* note: Five locations with statistically significant gamma exposure were found in the lower pond area.

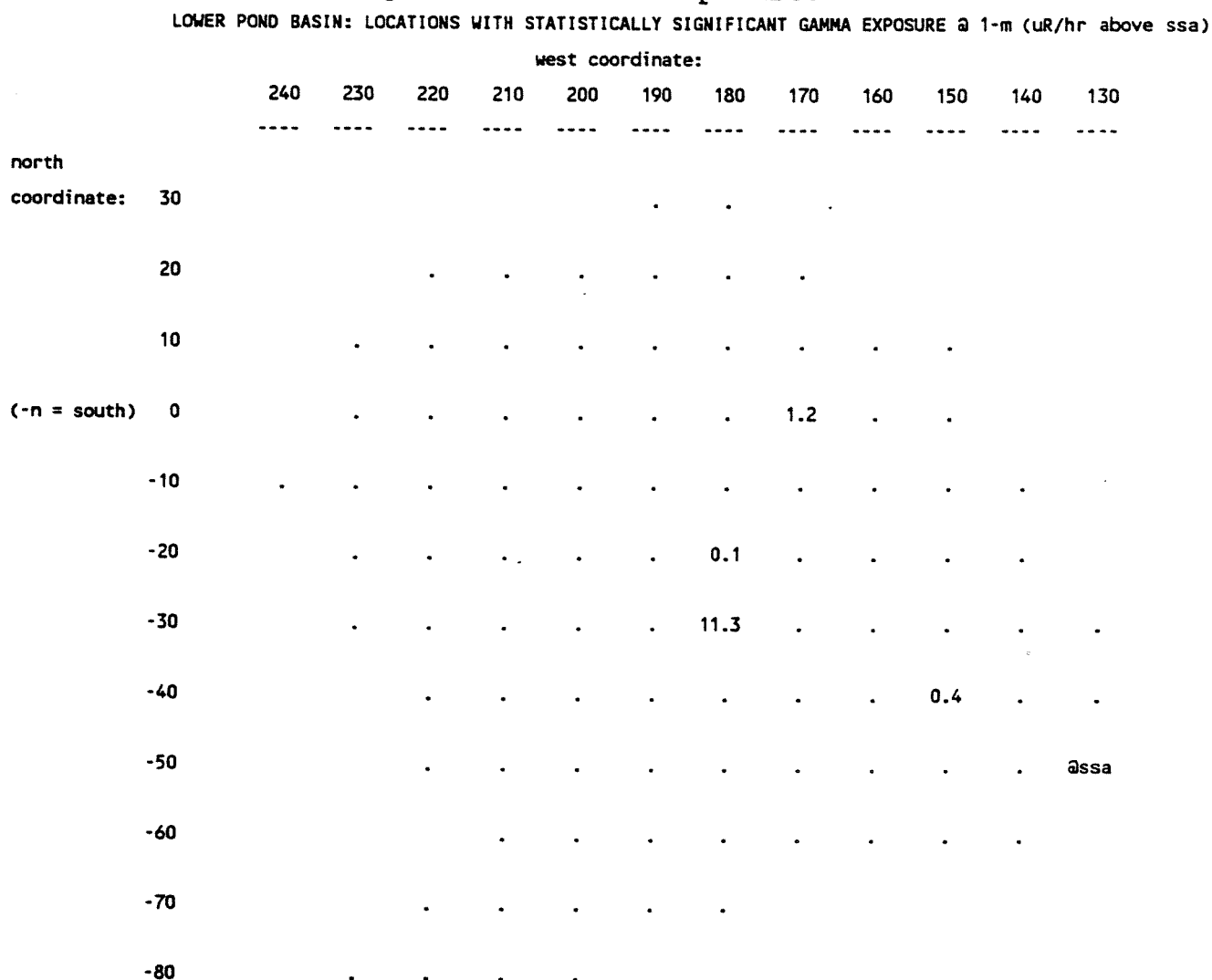
Figure 7. Map of Lower Pond Surface Beta Activity.

LOWER POND BASIN: AVERAGE PANCAKE-GM "BETA" ACTIVITY @ 1-cm (dpm/100cm2)											
west coordinate:											
	240	230	220	210	200	190	180	170	160	150	140
	----	----	----	----	----	----	----	----	----	----	----
north											
coordinate: 30						3,887	3,169				
20			3,435	3,732	3,142	3,915	3,753	4,101			
10		4,019	4,287	3,781	3,223	3,886	3,275	5,273	4,872	4,259	
(-n = south) 0		3,382	3,009	3,538	3,595	3,891	3,833	5,112	4,180	5,294	
-10	4,127	3,780	4,050	3,938	3,300	3,888	4,046	4,180	5,031	4,423	4,740
-20		4,260	3,754	3,937	4,207	4,497	4,369	4,606	4,290	4,392	4,501
-30		5,329	4,288	3,995	4,234	4,501	6,215	4,022	4,154	4,235	4,045
-40			3,808	3,647	3,755	4,179	3,939	4,738	4,396	5,271	4,743
-50			3,753	3,433	4,255	4,696	4,419	4,506	5,383	4,541	4,574
-60				3,691	3,571	4,179	4,490	3,647	4,624	4,919	4,829
-70				4,099	3,607	3,720	3,939	3,633			
-80				4,412	4,421	3,675	4,124				

LOWER POND BASIN				TOTAL SDF SURVEY			
1-cm BETA ACTIVITY				1-cm BETA ACTIVITY			
avg dpm/100cm2				avg dpm/100cm2			
-----				-----			
median	=	4,050		BkGd = median	=	4,207	
mean	=	4,168		mean	=	4,200	
sdev	=	552		sdev	=	555	
max	=	6,215		max	=	6,215	
min	=	3,009	ssa =	BkGd + (1,291)	min	=	2,325
n	=	95	* ssa =	5.498 dpm/100cm2	n	=	811

\* note: One location with statistically significant beta activity was found in the lower pond area.

Figure 8. Map of Lower Pond Locations With Statistically Significant Gamma Exposure.



LOWER POND BASIN  
GAMMA EXPOSURE @ 1-m  
avg (uR/hr)

-----  
median = 14.0  
mean = 14.4  
sdev = 1.6  
max = 27.5  
min = 13.3  
n = 95

ssa = BkGd + (2.4)  
\* ssa = 16.2 uR/hr

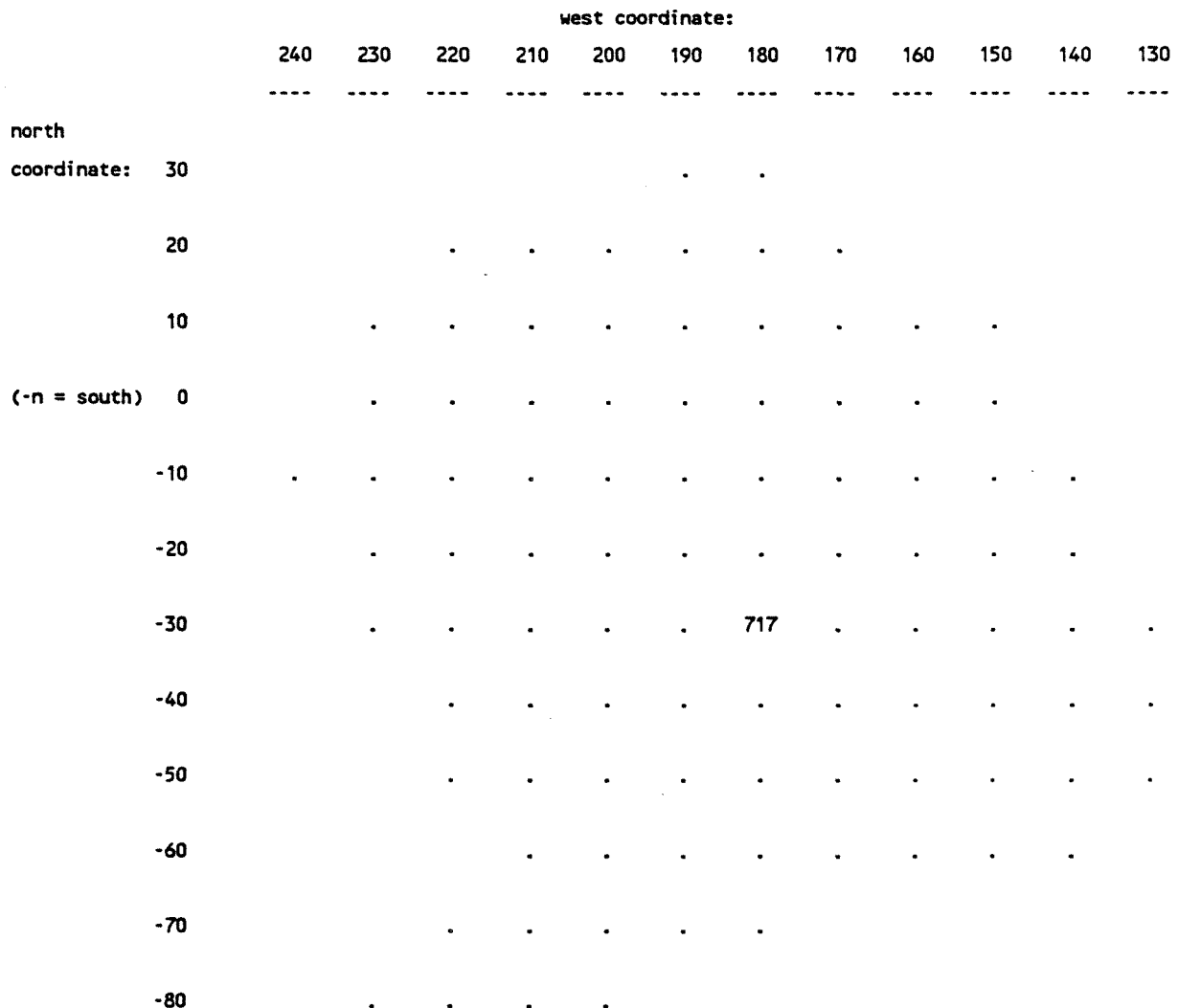
TOTAL SDF SURVEY  
GAMMA EXPOSURE @ 1-m  
avg (uR/hr)

-----  
BkGd = median = 13.8  
mean = 13.9  
sdev = 1.0  
max = 27.5  
min = 9.8  
n = 812

\* note: Five locations with statistically significant gamma exposure were found in the lower pond area.

Figure 9. Map of Lower Pond Locations With Statistically Significant Beta Activity.

LOWER POND BASIN: LOCATIONS WITH STATISTICALLY SIGNIFICANT PANCAKE-GM "BETA" ACTIVITY @ 1-cm (dpm/100cm<sup>2</sup> above ssa)



LOWER POND BASIN  
1-cm BETA ACTIVITY  
avg dpm/100cm<sup>2</sup>

-----  
median = 4,050  
mean = 4,168  
sdev = 552  
max = 6,215  
min = 3,009  
n = 95

ssa = BkGd + (1,291)  
\* ssa = 5,498 dpm/100cm<sup>2</sup>

TOTAL SDF SURVEY  
1-cm BETA ACTIVITY  
avg dpm/100cm<sup>2</sup>

-----  
BkGd = median = 4,207  
mean = 4,200  
sdev = 555  
max = 6,215  
min = 2,325  
n = 811

\* note: One location with statistically significant beta activity was found in the lower pond area.



Figure 10. Isoplot of Lower Pond Gamma Exposure -- Isometric View

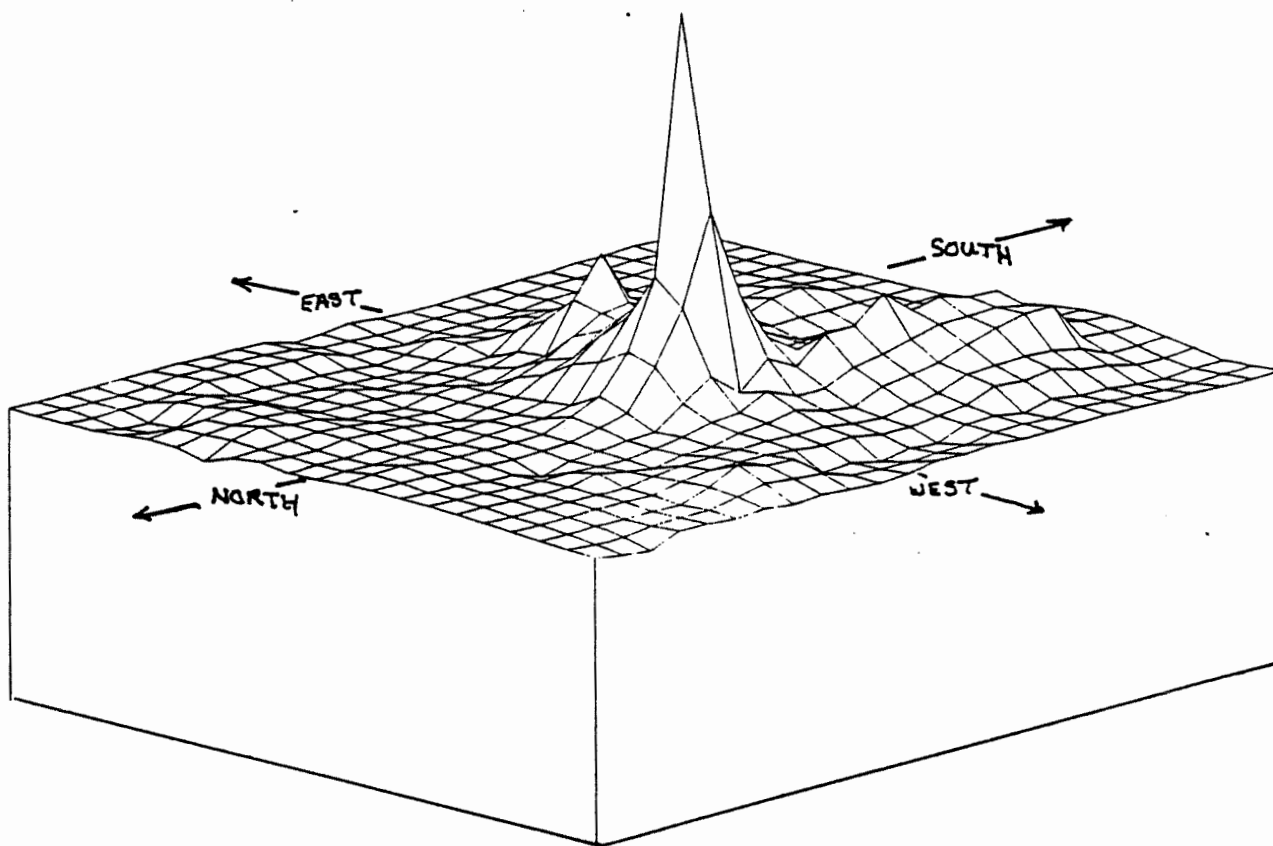
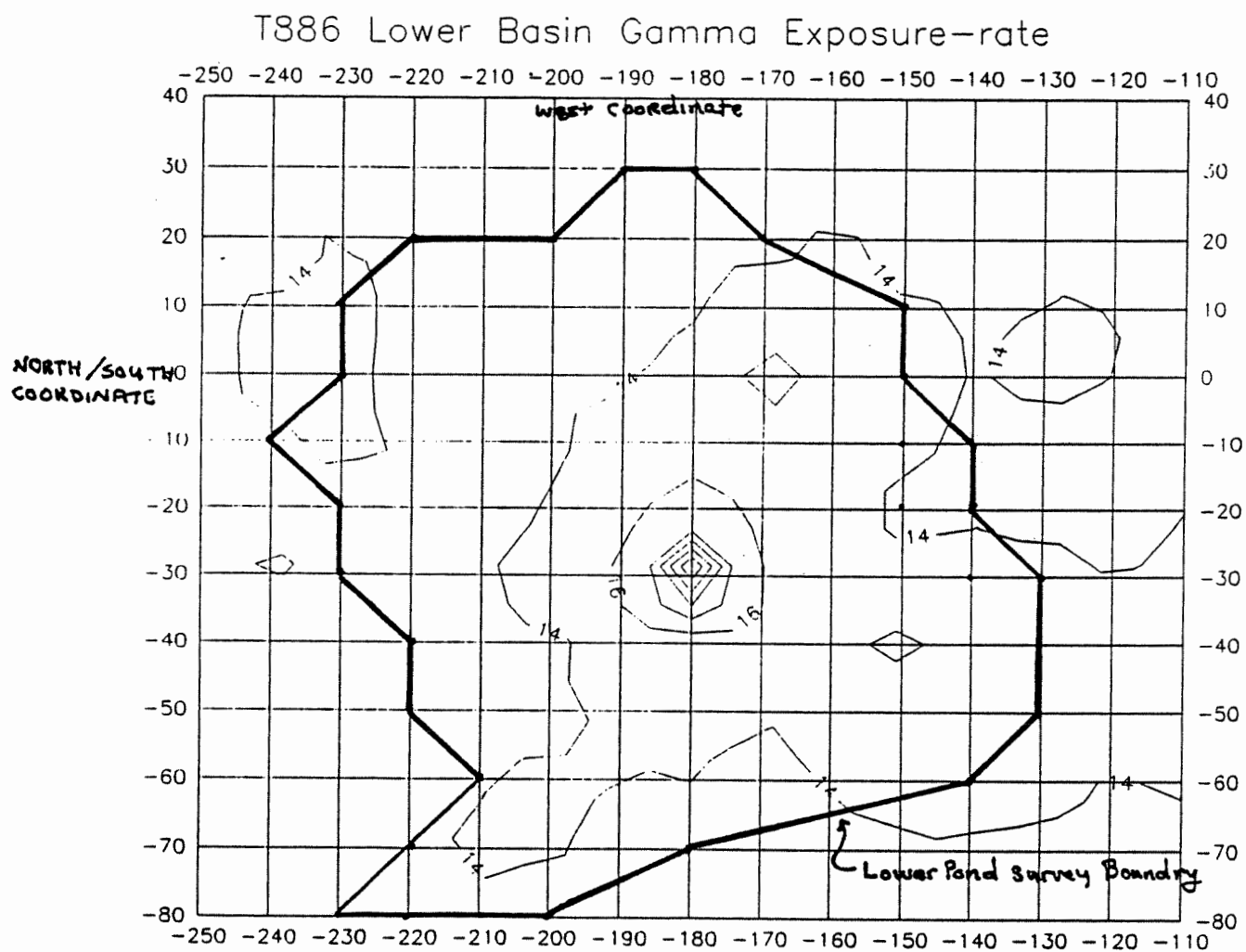


Figure 11. Isoplot of Lower Pond Gamma Exposure -- Map View



**7.3 Upper Pond Basin:** A statistical summary of the Upper Pond Basin survey results are presented in Table 4-1. SSA values have been estimated from the Upper Pond Basin data so the area data can be compared to the overall site data.

The averaged radiation levels for each location on the sample grid for the Upper Pond Basin are presented in Table 4-2. The radiation levels for each 10-ft grid interval are shown in map format in Figure 12 (Gamma Activity), Figure 13 (Gamma Exposure), and Figure 14 (Beta Activity). The survey found one location in the Upper Pond Basin having statistically significant surface beta activity. This reading was anomalous for the Upper Pond Area, compared to the rest of the measurements, but was only marginally elevated above ssa level. In terms of the overall SDF site survey data, the anomalous value falls at the high end of, but still within, the range of normal background radiation. The gamma activity for this same location was at normal background, and this was the only location found in the total SDF site survey that showed an elevated surface beta activity without a concomitant elevation in gamma activity. Thus, the meaning of this measurement in terms of defining a potentially contaminated point is ambiguous. Figure 15 shows the location of this elevated beta reading within the Upper Pond Basin.

All other beta and gamma readings in the upper pond basin were indistinguishable from normal background.

		AVG GAMMA @ 1-m (cpm)	AVG BETA @ 1-cm (dpm)	AVG GAMMA EXPOSURE (uR/Hr)	AVG BETA (dpm/100cm <sup>2</sup> )
UPPER		-----	-----	-----	-----
POND	median	= 2954	873	13.7	4,362
AREA	mean	= 2957	864	13.7	4,306
SUMMARY	sdev	= 73	114	0.3	566
	max	= 3127	1,105	14.5	5,526
	min	= 2733	508	12.7	2,542
	n	= 78	78	78	78
		-----	-----	-----	-----
ssa based		2954	873	13.7	4,362
on upper pond		+ 170	+ 265	+ 0.7	+ 1,317
area data:		= 3124	1,138	14.4	5,679
		-----	-----	-----	-----
ssa based BkGd		= 2966	841	13.8	4,207
on total		+ 523	+ 258	+ 2.4	+ 1,291
survey data:		= 3489	1,099	16.2	5,498
... ..		-----	-----	-----	-----

Table 4-1. Statistical Summary of Upper Pond Basin Survey Results

Upper Pond Basin -- Averaged Radiation Levels at  
Each Survey Location.

SDF N/S WEST  
AREA:COORD:COORD:  
D AVG GAMMA 7 a1-m(cpm)  
AVG BETA a1-m(cpm)  
AVG GAMMA EXPOSURE (uR/Hr)  
AVG BETA (dpm/100cm2)

UP	60 S	130 V	3051	841	14.2	4,207
UP	70 S	170 V	2894	817	13.4	4,085
UP	70 S	160 V	2999	875	13.9	4,377
UP	70 S	150 V	2951	882	13.7	4,408
UP	70 S	140 V	2960	929	13.8	4,645
UP	70 S	130 V	2920	952	13.6	4,760
UP	70 S	120 V	2931	706	13.6	3,531
UP	80 S	190 V	2898	975	13.5	4,875
UP	80 S	180 V	2970	1002	13.8	5,011
UP	80 S	170 V	3002	1035	13.9	5,175
UP	80 S	160 V	2942	854	13.7	4,271
UP	80 S	150 V	3037	1000	14.1	5,000
UP	80 S	140 V	2966	858	13.8	4,290
UP	80 S	130 V	3113	909	14.5	4,543
UP	80 S	120 V	2973	811	13.8	4,053
UP	90 S	200 V	2956	746	13.7	3,732
UP	90 S	190 V	3084	986	14.3	4,928
UP	90 S	180 V	2995	607	13.9	3,036
UP	90 S	170 V	3009	1041	14.0	5,203
UP	90 S	160 V	2993	805	13.9	4,027
UP	90 S	150 V	2834	959	13.2	4,793
UP	90 S	140 V	2878	885	13.4	4,426
UP	90 S	130 V	2915	881	13.5	4,403
UP	90 S	120 V	3127	1040	14.5	5,201
UP	100 S	200 V	3024	918	14.0	4,592
UP	100 S	190 V	3044	1011	14.1	5,057
UP	100 S	180 V	2945	792	13.7	3,962
UP	100 S	170 V	2943	943	13.7	4,714
UP	100 S	160 V	3018	974	14.0	4,871
UP	100 S	150 V	2948	913	13.7	4,566
UP	100 S	140 V	2952	966	13.7	4,830
UP	100 S	130 V	2985	750	13.9	3,748
UP	100 S	120 V	3040	969	14.1	4,845
UP	100 S	110 V	3058	1105	14.2	5,326
UP	100 S	100 V	3079	827	14.3	4,135
UP	110 S	190 V	2993	846	13.9	4,230
UP	110 S	180 V	2978	771	13.8	3,854
UP	110 S	170 V	3033	758	14.1	3,790
UP	110 S	160 V	2921	854	13.6	4,269
UP	110 S	150 V	2950	911	13.7	4,553
UP	110 S	140 V	3026	1014	14.1	5,069
UP	110 S	130 V	3051	938	14.2	4,689
UP	110 S	120 V	3037	872	14.1	4,362
UP	110 S	110 V	2938	728	13.6	3,640
UP	120 S	190 V	2954	981	13.7	4,906
UP	120 S	180 V	2932	866	13.6	4,329
UP	120 S	170 V	2893	770	13.4	3,852
UP	120 S	160 V	2980	1036	13.8	5,180
UP	120 S	150 V	2943	893	13.7	4,467
UP	120 S	140 V	3000	921	13.9	4,604
UP	120 S	130 V	2989	867	13.9	4,334
UP	120 S	120 V	3039	904	14.1	4,520
UP	120 S	110 V	3004	799	14.0	3,993
UP	130 S	190 V	2947	924	13.7	4,620
UP	130 S	180 V	2875	706	13.4	3,529
UP	130 S	170 V	2851	680	13.2	3,398
UP	130 S	160 V	2898	508	13.5	2,542
UP	130 S	150 V	2903	577	13.5	2,884
UP	130 S	140 V	3017	905	14.0	4,523
UP	130 S	130 V	2969	753	13.8	3,764
UP	130 S	120 V	2916	898	13.5	4,491
UP	130 S	110 V	2980	773	13.8	3,863
UP	140 S	180 V	2845	894	13.2	4,472
UP	140 S	170 V	2872	805	13.3	4,027
UP	140 S	160 V	2923	873	13.6	4,366
UP	140 S	150 V	3036	961	14.1	4,807
UP	140 S	140 V	2990	790	13.9	3,949
UP	140 S	130 V	3024	976	14.1	4,882
UP	140 S	120 V	2898	798	13.5	3,988
UP	140 S	110 V	2923	786	13.6	3,932
UP	150 S	180 V	2811	910	13.1	4,548
UP	150 S	170 V	2733	802	12.7	4,011
UP	150 S	160 V	2821	767	13.1	3,833
UP	150 S	150 V	2864	663	13.3	3,313
UP	150 S	140 V	2904	779	13.5	3,896
UP	150 S	130 V	2891	704	13.4	3,520
UP	150 S	120 V	2898	807	13.5	4,034
UP	150 S	110 V	2824	848	13.1	4,239

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Figure 12. Map of Upper Pond Ambient Gamma Activity.

## UPPER POND BASIN AMBIENT GAMMA ACTIVITY @ 1-m (avg cpm)

		west coordinate:									
		200	190	180	170	160	150	140	130	120	110
		....	....	....	....	....	....	....	....	....	....
south											
coordinate: -60		3051									
-70					2894	2999	2951	2960	2920	2931	
-80		2898		2970	3002	2942	3037	2966	3113	2973	
-90		2956	3084	2995	3009	2993	2834	2878	2915	3127	
-100		3024	3044	2945	2943	3018	2948	2952	2985	3040	3058
-110		3079	2993	2978	3033	2921	2950	3026	3051	3037	2938
-120		2954		2932	2893	2980	2943	3000	2989	3039	3004
-130		2947		2875	2851	2898	2903	3017	2969	2916	2980
-140		2845			2872	2923	3036	2990	3024	2898	2923
-150		2811			2733	2821	2864	2904	2891	2898	2824

UPPER POND BASIN  
1-m AMBIENT GAMMA ACTIVITY  
(avg cpm)

-----  
 median = 2954  
 mean = 2957  
 sdev = 73  
 max = 3127  
 min = 2733  
 n = 78

TOTAL SDF SURVEY  
1-m AMBIENT GAMMA ACTIVITY  
(avg cpm)

-----  
 BkGd = median = 2966  
 mean = 2996  
 sdev = 225  
 max = 5914  
 min = 2097  
 n = 812

ssa = BkGd + (523)  
 \* ssa = 3489 avg cpm

\* note: no statistically significant gamma activity was found in the upper pond area.

Figure 13. Map of Upper Pond Gamma Exposure.

UPPER POND BASIN AMBIENT GAMMA EXPOSURE @ 1-m (uR/hr)

	west coordinate:									
	200	190	180	170	160	150	140	130	120	110
	....	....	....	....	....	....	....	....	....	....
south										
coordinate: -60								14.2		
-70				13.4	13.9	13.7	13.8	13.6	13.6	
-80		13.5	13.8	13.9	13.7	14.1	13.8	14.5	13.8	
-90	13.7	14.3	13.9	14.0	13.9	13.2	13.4	13.5	14.5	
-100	14.0	14.1	13.7	13.7	14.0	13.7	13.7	13.9	14.1	14.2
-110	14.3	13.9	13.8	14.1	13.6	13.7	14.1	14.2	14.1	13.6
-120		13.7	13.6	13.4	13.8	13.7	13.9	13.9	14.1	14.0
-130		13.7	13.4	13.2	13.5	13.5	14.0	13.8	13.5	13.8
-140			13.2	13.3	13.6	14.1	13.9	14.1	13.5	13.6
-150			13.1	12.7	13.1	13.3	13.5	13.4	13.5	13.1

UPPER POND BASIN  
1-m AMBIENT GAMMA EXPOSURE  
avg (uR/hr)

-----  
median = 13.7  
mean = 13.7  
sdev = 0.3  
max = 14.5  
min = 12.7  
n = 78

TOTAL SDF SURVEY  
1-m AMBIENT GAMMA EXPOSURE  
avg (uR/hr)

-----  
BkGd = median = 13.8  
mean = 13.9  
sdev = 1.0  
max = 27.5  
min = 9.8  
n = 812

$$\text{ssa} = \text{BkGd} + (2.4)$$

$$* \text{ssa} = 16.2 \text{ uR/hr}$$

\* note: No statistically significant gamma exposure was found in the upper pond area.

Figure 14. Map of Upper Pond Surface Beta Activity.

UPPER POND BASIN SURFACE BETA ACTIVITY @ 1-cm (dpm/100cm2)

	west coordinate:									
	200	190	180	170	160	150	140	130	120	110
	....	....	....	....	....	....	....	....	....	....
south										
coordinate: -60									4,207	
-70				4,085	4,377	4,408	4,645	4,760	3,531	
-80		4,875	5,011	5,175	4,271	5,000	4,290	4,543	4,053	
-90	3,732	4,928	3,036	5,203	4,027	4,793	4,426	4,403	5,201	
-100	4,592	5,057	3,962	4,714	4,871	4,566	4,830	3,748	4,845	5,526
-110	4,135	4,230	3,854	3,790	4,269	4,553	5,069	4,689	4,362	3,640
-120		4,906	4,329	3,852	5,180	4,467	4,604	4,334	4,520	3,993
-130		4,620	3,529	3,398	2,542	2,884	4,523	3,764	4,491	3,863
-140			4,472	4,027	4,366	4,807	3,949	4,882	3,988	3,932
-150			4,548	4,011	3,833	3,313	3,896	3,520	4,034	4,239

UPPER POND BASIN  
BETA ACTIVITY @ 1-cm  
AVG (dpm/100cm2)

-----  
median = 4,362  
mean = 4,306  
sdev = 566  
max = 5,526  
min = 2,542  
n = 78

TOTAL SDF SURVEY  
BETA ACTIVITY @ 1-cm  
AVG (dpm/100cm2)

-----  
BkGd = median = 4,207  
mean = 4,200  
sdev = 555  
max = 6,215  
min = 2,326  
n = 811

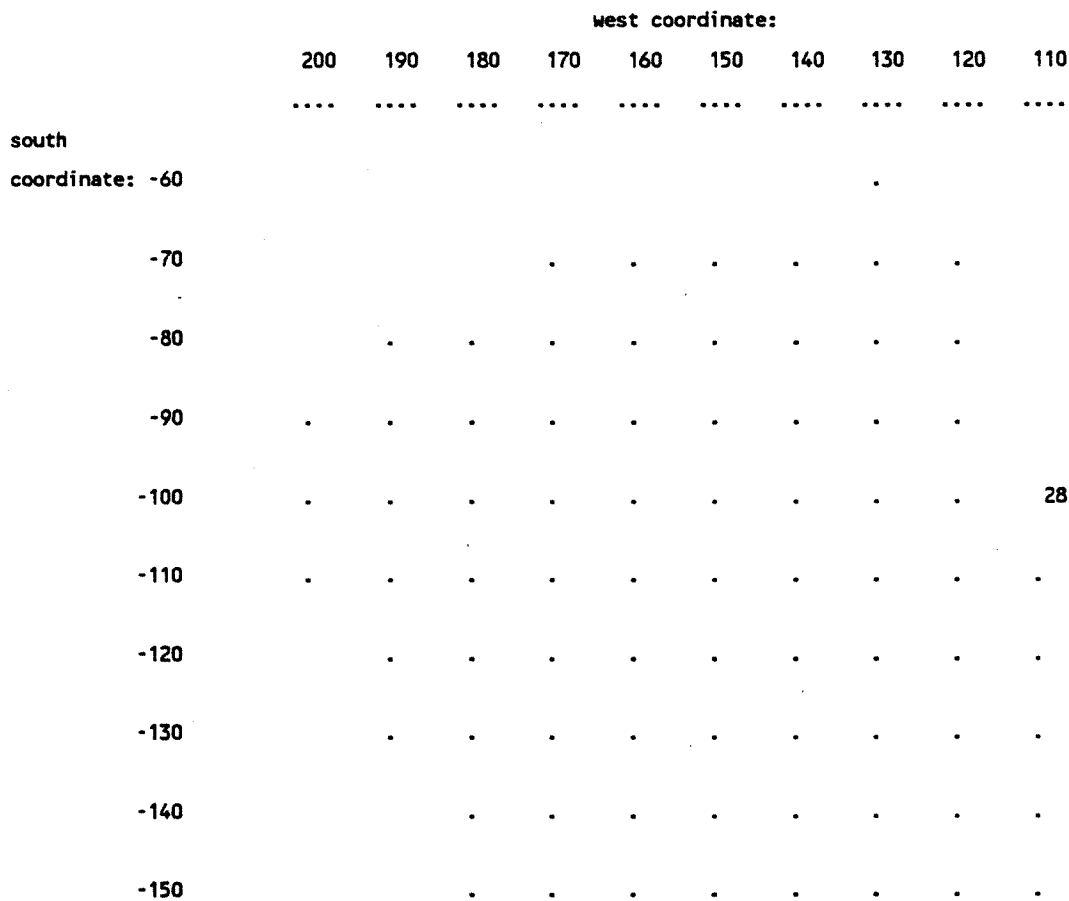
$$\text{ssa} = \text{BkGd} + (1,291)$$

$$* \text{ssa} = 5,498 \text{ dpm/100cm2}$$

\* note: One location with statistically significant beta activity was found in the upper pond area.

Figure 15. Map of Upper Pond Locations With Statistically Significant Beta Activity.

UPPER POND BASIN LOCATIONS WITH STATISTICALLY SIGNIFICANT SURFACE BETA ACTIVITY @ 1-cm (dpm/100cm<sup>2</sup>)



UPPER POND BASIN  
BETA ACTIVITY @ 1-cm  
AVG (dpm/100cm<sup>2</sup>)  
-----  
median = 4,362  
mean = 4,306  
sdev = 566  
max = 5,526  
min = 2,542  
n = 78

TOTAL SDF SURVEY  
BETA ACTIVITY @ 1-cm  
AVG (dpm/100cm<sup>2</sup>)  
-----  
BkGd = median = 4,207  
mean = 4,200  
sdev = 555  
max = 6,215  
min = 2,326  
n = 81

ssa = BkGd + (1,291)  
\* ssa = 5,498 dpm/100cm<sup>2</sup>

\* note: One location with statistically significant beta activity was found in the upper pond area.



**7.4 West Area:** A statistical summary of the West Area survey results are presented in Table 5-1. SSA values have been estimated from the West Area data so the area data can be compared to the overall site data.

The averaged radiation levels for each location on the sample grid for the West Area are presented in Table 5-2. The radiation levels for each 10-ft grid interval are shown in map format in Figure 16 (Gamma Activity), Figure 17 (Gamma Exposure), and Figure 18 (Beta Activity). The survey found seven locations having statistically significant gamma activity. These locations are mapped in Figure 19 (Gamma Exposure). No statistically significant surface beta activity was recorded.

All of the seven locations in the West Area having statistically significant gamma activity, were nevertheless only marginally above normal background. Note that all locations near the siltstone rock formations measured on the high side of the normal background range, and that the locations which showed activity levels above the ssa for the site, were all especially close to the massive rock cliffs along the west boundry of the site. The elevated readings in these instances are due to the higher background radioactivity of the natural mineral constituents in the siltstone cliff. All of the measurements that were made at locations away from the rock formations were indistinguishable from the normal background that is characteristic of the alluvium.

		AVG GAMMA	AVG BETA	AVG GAMMA	AVG BETA
		@1-m(cpm)	@1-cm(dpm)	EXPOSURE	(dpm/100cm2)
		-----	-----	-----	-----
WEST AREA SUMMARY	median	= 2916	794	13.5	3,969
	mean	= 2972	795	13.8	3,975
	sdev	= 189	96	0.9	482
	max	= 3831	1,076	17.8	5,382
	min	= 2572	567	11.9	2,837
	n	= 333	333	333	333
		-----	-----	-----	-----
ssa based		2916	794	13.5	3,969
on west		+ 440	+ 224	+ 2.1	+ 1,122
area data:		= 3356	1,018	15.6	5,091
		-----	-----	-----	-----
ssa based		BkGd = 2966	841	13.8	4,207
on total		+ 523	+ 258	+ 2.4	+ 1,291
survey data:		= 3489	1,099	16.2	5,498
---		-----	-----	-----	-----

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Table 5-1. Statistical Summary of West Area Survey Results.

Table 5-2. West Area -- Averaged Radiation Levels at Each Survey Location.

WEST AREA: Averaged Rad Level at Each Location								WEST AREA: Averaged Rad Level at Each Location							
SDF AREA	N/S COORD	WEST COORD	D ?	AVG GAMMA a1-m(cpm)	AVG BETA a1-cm(dpm)	EXPOSURE (uR/Hr)	AVG BETA (dpm/100cm2)	SDF AREA	N/S COORD	WEST COORD	D ?	AVG GAMMA a1-m(cpm)	AVG BETA a1-cm(dpm)	EXPOSURE (uR/Hr)	AVG BETA (dpm/100cm2)
W	10 S	310 W		3446	831	16.0	4,153	W	80 S	390 W		3753	726	17.4	3,630
W	10 S	300 W		3277	969	15.2	4,844	W	80 S	380 W		3358	1032	15.6	5,161
W	10 S	290 W		3201	809	14.9	4,047	W	80 S	370 W		3226	713	15.0	3,564
W	10 S	280 W		3192	836	14.8	4,179	W	80 S	360 W		3199	827	14.9	4,135
W	10 S	270 W		3036	836	14.1	4,180	W	80 S	350 W		3062	870	14.2	4,352
W	10 S	260 W		3038	799	14.1	3,994	W	80 S	340 W		3058	741	14.2	3,706
W	10 S	250 W		3010	703	14.0	3,513	W	80 S	330 W		3023	813	14.0	4,066
W	20 S	320 W		3471	931	16.1	4,657	W	80 S	320 W		2960	719	13.8	3,594
W	20 S	310 W		3157	1018	14.7	5,091	W	80 S	310 W		2966	970	13.8	4,850
W	20 S	300 W		3166	847	14.7	4,235	W	80 S	300 W		2947	567	13.7	2,837
W	20 S	290 W		3122	820	14.5	4,102	W	80 S	290 W	(ditch)				
W	20 S	280 W		3110	602	14.5	3,008	W	80 S	280 W		2871	757	13.3	3,783
W	20 S	270 W		2996	761	13.9	3,807	W	80 S	270 W		2902	781	13.5	3,905
W	20 S	260 W		2912	724	13.5	3,618	W	80 S	260 W		2920	686	13.6	3,430
W	20 S	250 W		2966	835	13.8	4,177	W	80 S	250 W		2844	728	13.2	3,638
W	20 S	240 W		2963	762	13.8	3,810	W	80 S	240 W		2823	799	13.1	3,997
W	30 S	330 W		3517	798	16.3	3,992	W	80 S	230 W		2936	882	13.6	4,412
W	30 S	320 W		3220	735	15.0	3,674	W	80 S	220 W		2904	884	13.5	4,421
W	30 S	310 W		3204	847	14.9	4,233	W	90 S	390 W		3496	804	16.2	4,022
W	30 S	300 W		3143	858	14.6	4,288	W	90 S	380 W		3245	929	15.1	4,645
W	30 S	290 W		3072	788	14.3	3,940	W	90 S	370 W		3106	804	14.4	4,018
W	30 S	280 W		2986	735	13.9	3,674	W	90 S	360 W		3080	817	14.3	4,084
W	30 S	270 W		2862	773	13.3	3,863	W	90 S	350 W		2977	793	13.8	3,967
W	30 S	260 W		2872	900	13.3	4,500	W	90 S	340 W		2931	818	13.6	4,092
W	30 S	250 W		2868	623	13.3	3,117	W	90 S	330 W		2690	676	12.5	3,382
W	30 S	240 W		3033	1076	14.1	5,382	W	90 S	320 W		2734	623	12.7	3,116
W	40 S	340 W		3316	857	15.4	4,287	W	90 S	310 W		2806	744	13.0	3,721
W	40 S	330 W		3147	821	14.6	4,103	W	90 S	300 W		2779	712	12.9	3,561
W	40 S	320 W		3150	697	14.6	3,487	W	90 S	290 W		2691	675	12.5	3,375
W	40 S	310 W		3141	868	14.6	4,341	W	90 S	280 W		2823	850	13.1	4,251
W	40 S	300 W		2989	847	13.9	4,237	W	90 S	270 W		2806	803	13.0	4,016
W	40 S	290 W		3037	783	14.1	3,913	W	90 S	260 W		2826	860	13.1	4,301
W	40 S	280 W		3010	762	14.0	3,808	W	90 S	250 W		2758	713	12.8	3,564
W	40 S	270 W		2851	682	13.2	3,410	W	90 S	240 W		2707	761	12.6	3,803
W	40 S	260 W		2887	895	13.4	4,473	W	90 S	230 W		2679	663	12.4	3,317
W	40 S	250 W		2880	756	13.4	3,781	W	90 S	220 W		2985	877	13.9	4,385
W	40 S	240 W		2971	751	13.8	3,755	W	90 S	210 W		2835	856	13.2	4,281
W	40 S	230 W		2940	618	13.7	3,090	W	100 S	400 W		3743	835	17.4	4,177
W	50 S	350 W		3311	831	15.4	4,154	W	100 S	390 W		3357	964	15.6	4,820
W	50 S	340 W		3257	778	15.1	3,888	W	100 S	380 W		3257	792	15.1	3,962
W	50 S	330 W		3066	820	14.2	4,100	W	100 S	370 W		3175	921	14.8	4,606
W	50 S	320 W		3122	964	14.5	4,819	W	100 S	360 W		3140	822	14.6	4,111
W	50 S	310 W		3046	881	14.2	4,403	W	100 S	350 W		3109	854	14.4	4,271
W	50 S	300 W		3000	797	14.0	3,986	W	100 S	340 W		3067	784	14.2	3,919
W	50 S	290 W		3003	871	14.0	4,356	W	100 S	330 W		2948	762	13.7	3,811
W	50 S	280 W		2884	880	13.4	4,401	W	100 S	320 W		2881	756	13.4	3,778
W	50 S	270 W		2940	917	13.7	4,408	W	100 S	310 W		2840	629	13.2	3,147
W	50 S	260 W		2943	860	13.7	4,297	W	100 S	300 W		2753	730	12.8	3,649
W	50 S	250 W		2881	768	13.4	4,331	W	100 S	290 W		2834	910	13.2	4,550
W	50 S	240 W		2949	812	13.7	4,060	W	100 S	280 W		2869	767	13.3	3,833
W	50 S	230 W		2960	760	13.8	3,798	W	100 S	270 W		2888	844	13.4	4,218
W	60 S	370 W		3452	997	16.0	4,986	W	100 S	260 W		2870	789	13.3	3,946
W	60 S	360 W		3311	854	15.4	4,271	W	100 S	250 W		2782	827	12.9	4,135
W	60 S	350 W		3156	876	14.7	4,378	W	100 S	240 W		2786	886	12.9	4,431
W	60 S	340 W		3147	799	14.6	3,993	W	100 S	230 W		2666	726	12.4	3,630
W	60 S	330 W		3067	602	14.2	3,010	W	100 S	220 W		2943	944	13.7	4,719
W	60 S	320 W		2995	828	13.9	4,138	W	100 S	210 W		2970	786	13.8	3,930
W	60 S	310 W		2995	724	13.9	3,621	W	110 S	400 W		3517	940	16.3	4,698
W	60 S	300 W		3047	882	14.2	4,412	W	110 S	390 W		3429	839	15.9	4,195
W	60 S	290 W		2882	791	13.4	3,956	W	110 S	380 W		3335	893	15.5	4,465
W	60 S	280 W		2878	702	13.4	3,511	W	110 S	370 W		3310	865	15.4	4,325
W	60 S	270 W		2939	825	13.7	4,124	W	110 S	360 W		3213	852	14.9	4,262
W	60 S	260 W		2949	809	13.7	4,043	W	110 S	350 W		3184	840	14.8	4,198
W	60 S	250 W		2893	956	13.4	4,779	W	110 S	340 W		3050	822	14.2	4,110
W	60 S	240 W		2884	816	13.4	4,080	W	110 S	330 W		2991	840	13.9	4,202
W	60 S	230 W		2944	846	13.7	4,230	W	110 S	320 W		2890	775	13.4	3,875
W	60 S	220 W		2925	752	13.6	3,758	W	110 S	310 W		2941	813	13.7	4,066
W	70 S	390 W		3831	944	17.8	4,719	W	110 S	300 W		2882	613	13.4	3,066
W	70 S	380 W		3483	892	16.2	4,461	W	110 S	290 W		2905	911	13.5	4,553
W	70 S	370 W		3278	855	15.2	4,274	W	110 S	280 W		2861	803	13.3	4,013
W	70 S	360 W		3224	838	15.0	4,188	W	110 S	270 W		2892	892	13.4	4,458
W	70 S	350 W		3100	809	14.4	4,046	W	110 S	260 W		2846	892	13.2	4,461
W	70 S	340 W		3138	832	14.6	4,159	W	110 S	250 W		2831	812	13.2	4,061
W	70 S	330 W		3035	866	14.1	4,330	W	110 S	240 W		2796	898	13.0	4,491
W	70 S	320 W		2996	700	13.9	3,501	W	110 S	230 W		2809	680	13.0	3,402
W	70 S	310 W		3013	863	14.0	4,313	W	110 S	220 W		2912	773	13.5	3,863
W	70 S	300 W		2939	758	13.7	3,792	W	110 S	210 W		3210	805	14.9	4,025
W	70 S	290 W	(ditch)					W	120 S	400 W		3360	786	15.6	3,928
W	70 S	280 W		2930	773	13.6	3,864	W	120 S	390 W		3340	926	15.5	4,631
W	70 S	270 W		2887	667	13.4	3,335	W	120 S	380 W		3334	1006	15.5	5,030
W	70 S	260 W		2846	773	13.2	3,866	W	120 S	370 W		3287	847	15.3	4,235
W	70 S	250 W		2888	851	13.4	4,253	W	120 S	360 W		3161	901	14.7	4,506
W	70 S	240 W		2911	729	13.5	3,645	W	120 S	350 W		3146	1010	14.6	5,051
W	70 S	230 W		2901	811	13.5	4,053	W	120 S	340 W		2969	1063	13.8	5,313
								W	120 S	330 W		3010	711	14.0	3,554

Table 5-2 (cont'd). West Area -- Averaged Radiation Levels at Each Survey Location.

WEST AREA: Averaged Rad Level at Each Location								WEST AREA: Averaged Rad Level at Each Location							
SDF AREA	N/S COORD	WEST COORD	D ?	AVG GAMMA g1-m(cpm)	AVG BETA g1-cm(dpm)	AVG GAMMA EXPOSURE (uR/Hr)	AVG BETA (dps/100cm2)	SDF AREA	N/S COORD	WEST COORD	D ?	AVG GAMMA g1-m(cpm)	AVG BETA g1-cm(dpm)	AVG GAMMA EXPOSURE (uR/Hr)	AVG BETA (dps/100cm2)
W	120 S	320 W		2877	607	13.4	3,034	W	160 S	350 W		2857	884	13.3	4,020
W	120 S	310 W		2848	738	13.2	3,688	W	160 S	340 W		2900	646	13.5	3,232
W	120 S	300 W	(ditch)					W	160 S	330 W		2811	680	13.1	3,398
W	120 S	290 W		2863	757	13.3	3,785	W	160 S	320 W		2872	746	13.3	3,728
W	120 S	280 W		2900	838	13.5	4,188	W	160 S	310 W		2968	660	13.8	3,301
W	120 S	270 W		2864	885	13.3	4,426	W	160 S	300 W		2833	722	13.2	3,608
W	120 S	260 W		2957	875	13.7	4,377	W	160 S	290 W		2905	771	13.5	3,854
W	120 S	250 W		2886	1007	13.4	5,034	W	160 S	280 W		2865	794	13.3	3,969
W	120 S	240 W		2863	815	13.3	4,075	W	160 S	270 W		2905	718	13.5	3,589
W	120 S	230 W		2877	776	13.4	3,880	W	160 S	260 W		2881	731	13.4	3,653
W	120 S	220 W		2991	832	13.9	4,159	W	160 S	250 W		2921	800	13.6	4,002
W	120 S	210 W	*	2922	835	13.6	4,176	W	160 S	240 W		2876	764	13.4	3,819
W	120 S	200 W	*	3242	921	15.1	4,606	W	160 S	230 W		2820	840	13.1	4,202
W	130 S	400 W		3242	921	15.1	4,606	W	160 S	220 W		2770	573	12.9	2,867
W	130 S	390 W		3340	915	15.5	4,574	W	160 S	210 W		2892	847	13.4	4,234
W	130 S	380 W		3330	905	15.5	4,527	W	160 S	200 W		2736	815	12.7	4,076
W	130 S	370 W		3252	990	15.1	4,952	W	170 S	400 W		3084	777	14.3	3,887
W	130 S	360 W		3067	881	14.3	4,407	W	170 S	390 W		3021	872	14.0	4,361
W	130 S	350 W		3032	850	14.1	4,251	W	170 S	380 W		2978	856	13.8	4,281
W	130 S	340 W		2902	871	13.5	4,354	W	170 S	370 W		2908	689	13.5	3,446
W	130 S	330 W		2929	744	13.6	3,718	W	170 S	360 W		2875	748	13.4	3,741
W	130 S	320 W		2916	817	13.5	4,083	W	170 S	350 W		2799	700	13.0	3,501
W	130 S	310 W		2907	890	13.5	4,449	W	170 S	340 W		2804	715	13.0	3,576
W	130 S	300 W	(ditch)					W	170 S	330 W		2880	847	13.4	4,237
W	130 S	290 W		2976	876	13.8	4,382	W	170 S	320 W		2864	900	13.3	4,502
W	130 S	280 W		3018	709	14.0	3,545	W	170 S	310 W		2900	916	13.5	4,578
W	130 S	270 W		2988	792	13.9	3,960	W	170 S	300 W		2774	750	12.9	3,748
W	130 S	260 W		2916	833	13.5	4,165	W	170 S	290 W		2902	941	13.5	4,703
W	130 S	250 W		2839	905	13.2	4,523	W	170 S	280 W		2877	729	13.4	3,647
W	130 S	240 W		2908	814	13.5	4,069	W	170 S	270 W		2847	718	13.2	3,589
W	130 S	230 W		2908	735	13.5	3,674	W	170 S	260 W		2866	671	13.3	3,354
W	130 S	220 W		2908	690	13.5	3,448	W	170 S	250 W		2819	787	13.1	3,937
W	130 S	210 W	*	3029	821	14.1	4,103	W	170 S	240 W		2851	739	13.2	3,695
W	130 S	200 W	*	2898	652	13.5	3,259	W	170 S	230 W		2793	588	13.0	2,941
W	140 S	400 W		3314	954	15.4	4,771	W	170 S	220 W		2766	666	12.9	3,329
W	140 S	390 W		3340	775	15.5	3,873	W	170 S	210 W		2774	718	12.9	3,591
W	140 S	380 W		3268	864	15.2	4,322	W	170 S	200 W		2668	578	12.4	2,889
W	140 S	370 W		3090	983	14.4	4,915	W	180 S	400 W		2941	756	13.7	3,778
W	140 S	360 W		3025	765	14.1	3,824	W	180 S	390 W		3016	727	14.0	3,633
W	140 S	350 W		2975	777	13.8	3,886	W	180 S	380 W		2831	570	13.2	2,852
W	140 S	340 W		3036	690	14.1	3,449	W	180 S	370 W		2853	803	13.3	4,015
W	140 S	330 W		2902	752	13.5	3,758	W	180 S	360 W		2923	763	13.6	3,817
W	140 S	320 W		2918	659	13.6	3,294	W	180 S	350 W		2862	748	13.3	3,739
W	140 S	310 W		2877	706	13.4	3,531	W	180 S	340 W		2824	882	13.1	4,408
W	140 S	300 W		2901	751	13.5	3,757	W	180 S	330 W		2916	750	13.5	3,750
W	140 S	290 W		2763	745	12.8	3,725	W	180 S	320 W		2849	728	13.2	3,642
W	140 S	280 W		3039	676	14.1	3,382	W	180 S	310 W		2846	655	13.2	3,275
W	140 S	270 W		2946	681	13.7	3,405	W	180 S	300 W		2904	733	13.5	3,665
W	140 S	260 W		2852	684	13.2	3,420	W	180 S	290 W		2886	702	13.4	3,511
W	140 S	250 W		2921	747	13.6	3,734	W	180 S	280 W		2829	803	13.1	4,016
W	140 S	240 W		2960	863	13.8	4,315	W	180 S	270 W		2849	773	13.3	3,866
W	140 S	230 W		2955	895	13.7	4,474	W	180 S	260 W		2900	797	13.5	3,983
W	140 S	220 W		2896	844	13.5	4,218	W	180 S	250 W		2907	793	13.5	3,967
W	140 S	210 W		2931	819	13.6	4,094	W	180 S	240 W		2854	749	13.3	3,743
W	140 S	200 W	*	2906	764	13.5	3,818	W	180 S	230 W		2909	862	13.5	4,311
W	140 S	190 W		2801	747	13.0	3,737	W	180 S	220 W		2688	746	12.5	3,732
W	150 S	400 W		3228	1002	15.0	5,012	W	180 S	210 W		2622	580	12.2	2,902
W	150 S	390 W		3115	729	14.5	3,647	W	180 S	200 W		2572	633	11.9	3,165
W	150 S	380 W		3141	946	14.6	4,728	W	190 S	350 W		2853	771	13.3	3,854
W	150 S	370 W		3118	698	14.5	3,492	W	190 S	340 W		2895	711	13.5	3,554
W	150 S	360 W		2951	698	13.7	3,488	W	190 S	330 W		2903	683	13.5	3,414
W	150 S	350 W		2887	710	13.4	3,548	W	190 S	320 W		2838	812	13.2	4,060
W	150 S	340 W		2943	821	13.7	4,105	W	190 S	310 W		2839	610	13.2	3,050
W	150 S	330 W		2910	882	13.5	4,408	W	190 S	300 W		2792	722	13.0	3,608
W	150 S	320 W		2842	710	13.2	3,550	W	190 S	290 W		2854	737	13.3	3,684
W	150 S	310 W		2856	735	13.3	3,674	W	190 S	280 W		2777	775	12.9	3,875
W	150 S	300 W		2850	789	13.2	3,944	W	190 S	270 W		2837	636	13.2	3,181
W	150 S	290 W		3008	821	14.0	4,103	W	190 S	260 W		2858	741	13.3	3,706
W	150 S	280 W		2958	770	13.7	3,852	W	190 S	250 W		2753	656	12.8	3,282
W	150 S	270 W		3020	712	14.0	3,561	W	190 S	240 W		2905	776	13.5	3,879
W	150 S	260 W		2924	862	13.6	4,311	W	190 S	230 W		2899	921	13.5	4,605
W	150 S	250 W		2905	888	13.5	4,440	W	190 S	220 W		2945	924	13.7	4,620
W	150 S	240 W		2959	887	13.7	4,433	W	190 S	210 W		2721	974	12.6	4,871
W	150 S	230 W		2851	757	13.2	3,785	W	190 S	200 W		2666	828	12.4	4,140
W	150 S	220 W		2775	791	12.9	3,953	W	200 S	300 W		2753	659	12.8	3,295
W	150 S	210 W		2798	744	13.0	3,718	W	200 S	290 W		2703	720	12.6	3,598
W	150 S	200 W	*	2931	691	13.7	3,457	W	200 S	280 W		2799	747	13.0	3,735
W	150 S	190 W		2879	684	13.4	3,418	W	200 S	270 W		2737	611	12.7	3,056
W	160 S	400 W		3148	780	14.6	3,898	W	200 S	260 W		2864	616	13.3	3,082
W	160 S	390 W		3167	942	14.7	4,709	W	200 S	250 W		2747	643	12.8	3,213
W	160 S	380 W		3088	948	14.3	4,740	W	200 S	240 W		2744	652	12.7	3,260
W	160 S	370 W		2906	946	13.5	4,728	W	200 S	230 W		2794	733	13.0	3,667
W	160 S	360 W		2905	830	13.5	4,152	W	200 S	220 W		2858	915	13.3	4,576
								W	200 S	210 W		2735	762	12.7	3,810
								W	200 S	200 W		2589	617	12.0	3,084

Figure 16. Map of West Area Ambient Gamma Activity - west

[illegible]

Figure 16 (cont'd). Map of West Area Ambient Gamma Activity - east

(WEST AREA 1-m AMBIENT GAMMA (avg cpm)										page 2 of 2	
west coordinate:										(cont'd)	
290	280	270	260	250	240	230	220	210	200	190	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
3201	3192	3036	3038	3010							-10 south coordinate
3122	3110	2996	2912	2966	2963						-20
3072	2986	2862	2872	2868	3033						-30
3037	3010	2851	2887	2880	2971	2940					-40
3003	2884	2940	2943	2881	2949	2960					-50
2882	2878	2939	2949	2893	2884	2944	2925				-60
d	2930	2887	2846	2888	2911	2901					-70
d	2871	2902	2920	2844	2823	2936	2904				-80
2691	2823	2806	2826	2758	2707	2679	2985	2835			-90
2834	2869	2888	2870	2782	2786	2666	2943	2970			-100
2905	2861	2892	2846	2831	2796	2809	2912	3210			-110
2863	2900	2864	2957	2886	2863	2877	2991	2922	3242		-120
2976	3018	2988	2916	2839	2908	2908	2908	3029	2898		-130
2763	3039	2946	2852	2921	2960	2955	2896	2931	2906	2801	-140
3008	2958	3020	2924	2905	2959	2851	2775	2798	2931	2879	-150
2905	2865	2905	2881	2921	2876	2820	2770	2892	2736		-160
2902	2877	2847	2866	2819	2851	2793	2766	2774	2668		-170
2886	2829	2869	2900	2907	2854	2909	2688	2622	2572		-180
2854	2777	2837	2858	2753	2905	2899	2945	2721	2666		-190
2703	2799	2737	2864	2747	2744	2794	2858	2735	2589		-200

WEST AREA  
AMBIENT GAMMA @ 1-m  
(avg cpm)  
-----  
median= 2916  
mean= 2972  
sdev= 189  
max= 3831  
min= 2572  
n= 333

ssa = 8kGd + (523)  
= 3489 cpm

SDF SURVEY TOTAL  
AMBIENT GAMMA @ 1-m  
(avg cpm)  
-----  
median= 2966 =8kGd  
mean= 2996  
sdev= 225  
max= 5914  
min= 2097  
n= 812

Figure 17. Map of West Area Gamma Exposure - west

[illegible]

Figure 17 (cont'd). Map of West Area Gamma Exposure - east

(WEST AREA 1-m AMBIENT GAMMA EXPOSURE (uR/hr))										page 2 of 2	
west coordinate:										(cont'd)	
290	280	270	260	250	240	230	220	210	200	190	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
14.9	14.8	14.1	14.1	14.0							-10 south coordinate
14.5	14.5	13.9	13.5	13.8	13.8						-20
14.3	13.9	13.3	13.3	13.3	14.1						-30
14.1	14.0	13.2	13.4	13.4	13.8	13.7					-40
14.0	13.4	13.7	13.7	13.4	13.7	13.8					-50
13.4	13.4	13.7	13.7	13.4	13.4	13.7	13.6				-60
d	13.6	13.4	13.2	13.4	13.5	13.5					-70
d	13.3	13.5	13.6	13.2	13.1	13.6	13.5				-80
12.5	13.1	13.0	13.1	12.8	12.6	12.4	13.9	13.2			-90
13.2	13.3	13.4	13.3	12.9	12.9	12.4	13.7	13.8			-100
13.5	13.3	13.4	13.2	13.2	13.0	13.0	13.5	14.9			-110
13.3	13.5	13.3	13.7	13.4	13.3	13.4	13.9	13.6	15.1		-120
13.8	14.0	13.9	13.5	13.2	13.5	13.5	13.5	14.1	13.5		-130
12.8	14.1	13.7	13.2	13.6	13.8	13.7	13.5	13.6	13.5	13.0	-140
14.0	13.7	14.0	13.6	13.5	13.7	13.2	12.9	13.0	13.7	13.4	-150
13.5	13.3	13.5	13.4	13.6	13.4	13.1	12.9	13.4	12.7		-160
13.5	13.4	13.2	13.3	13.1	13.2	13.0	12.9	12.9	12.4		-170
13.4	13.1	13.3	13.5	13.5	13.3	13.5	12.5	12.2	11.9		-180
13.3	12.9	13.2	13.3	12.8	13.5	13.5	13.7	12.6	12.4		-190
12.6	13.0	12.7	13.3	12.8	12.7	13.0	13.3	12.7	12.0		-200

WEST AREA  
GAMMA EXPOSURE @ 1-m  
(uR/hr)  
-----  
median= 13.5  
mean= 13.8  
sdev= 0.9  
max= 17.8  
min= 11.9  
n= 333  
-----

ssa = Bkgd + (2.4)  
= 16.2 uR/hr

SDF SURVEY TOTAL  
GAMMA EXPOSURE @ 1-m  
(uR/hr)  
-----  
median= 13.8 =Bkgd  
mean= 13.9  
sdev= 1.0  
max= 27.5  
min= 9.8  
n= 812

Figure 18. Map of West Area Surface Beta Activity - west

[illegible]



Figure 18 (cont'd). Map of West Area Surface Beta Activity - east

(WEST AREA BETA ACTIVITY @ 1-cm (dpm/100cm <sup>2</sup> )										page 2 of 2	
west coordinate:										(cont'd)	
290	280	270	260	250	240	230	220	210	200	190	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
4,047	4,179	4,180	3,994	3,513							-10 south coordinate
4,102	3,008	3,807	3,618	4,177	3,810						-20
3,940	3,674	3,863	4,500	3,117	5,382						-30
3,913	3,808	3,410	4,473	3,781	3,755	3,090					-40
4,356	4,401	4,408	4,297	4,331	4,060	3,798					-50
3,956	3,511	4,124	4,043	4,779	4,080	4,230	3,758				-60
d	3,864	3,335	3,866	4,253	3,645	4,053					-70
d	3,783	3,905	3,430	3,638	3,997	4,412	4,421				-80
3,375	4,251	4,016	4,301	3,564	3,803	3,317	4,385	4,281			-90
4,550	3,833	4,218	3,946	4,135	4,431	3,630	4,719	3,930			-100
4,553	4,013	4,458	4,461	4,061	4,491	3,402	3,863	4,025			-110
3,785	4,188	4,426	4,377	5,034	4,075	3,880	4,159	4,176	4,606		-120
4,382	3,545	3,960	4,165	4,523	4,069	3,674	3,448	4,103	3,259		-130
3,725	3,382	3,405	3,420	3,734	4,315	4,474	4,218	4,094	3,818	3,737	-140
4,103	3,852	3,561	4,311	4,440	4,433	3,785	3,953	3,718	3,457	3,418	-150
3,854	3,969	3,589	3,653	4,002	3,819	4,202	2,867	4,234	4,076		-160
4,703	3,647	3,589	3,354	3,937	3,695	2,941	3,329	3,591	2,889		-170
3,511	4,016	3,866	3,983	3,967	3,743	4,311	3,732	2,902	3,165		-180
3,684	3,875	3,181	3,706	3,282	3,879	4,605	4,620	4,871	4,140		-190
3,598	3,735	3,056	3,082	3,213	3,260	3,667	4,576	3,810	3,084		-200

WEST AREA  
BETA ACTIVITY @ 1-cm  
(dpm/100cm<sup>2</sup>)  
-----  
median= 3,969  
mean= 3,975  
sdev= 482  
max= 5,382  
min= 2,837  
n= 333  
-----

ssa = BkGd + (1,291)  
= 5,498 dpm/100cm<sup>2</sup>

SDF SURVEY TOTAL  
BETA ACTIVITY @ 1-cm  
(dpm/100cm<sup>2</sup>)  
-----  
median= 4,207 =BkGd  
mean= 4,200  
sdev= 555  
max= 6,215  
min= 2,326  
n= 811

Figure 19. Map of West Area Locations With Statistically Significant Gamma Exposure - west

## SDF BASELINE SURVEY

(page 1 of 2)

**WEST AREA: LOCATIONS WITH STATISTICALLY SIGNIFICANT GAMMA EXPOSURE @ 1-m (uR/hr above ssa)**

west coordinate:

[illegible]

Figure 19 (cont'd). Map of West Area Locations With Statistically Significant Gamma Exposure - east

page 2 of 2 (cont'd)

(WEST AREA: LOCATIONS WITH STATISTICALLY SIGNIFICANT GAMMA EXPOSURE @ 1-m (uR/hr above ssa)

west coordinate:										
290	280	270	260	250	240	230	220	210	200	190
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
.	.	.	.	.						

WEST AREA  
GAMMA EXPOSURE @ 1-m  
(uR/hr)

-----  
median= 13.5  
mean= 13.8  
sdev= 0.9  
max= 17.8  
min= 11.9  
n= 333

-----  
ssa = 8kGd + (2.4)  
= 16.2 uR/hr

SDF SURVEY TOTAL  
GAMMA EXPOSURE @ 1-m  
(uR/hr)

-----  
median= 13.8 =8kGd  
mean= 13.9  
sdev= 1.0  
max= 27.5  
min= 9.8  
n= 842

**7.5 Northwest Area:** A statistical summary of the Northwest Area survey results are presented in Table 6-1. SSA values have been estimated from the Northwest Area data so the area data can be compared to the overall site data.

The averaged radiation levels for each location on the sample grid for the Northwest Area are presented in Table 6-2. The radiation levels for each 10-ft grid interval are shown in map format in Figure 20 (Gamma Activity), Figure 21 (Gamma Exposure), and Figure 22 (Beta Activity). The survey found four locations having statistically significant gamma activity. These locations are mapped in Figure 23 (Gamma Exposure). No statistically significant surface beta activity was recorded.

The four locations in the Northwest Area having statistically significant gamma activity, are all only marginally above normal background, and all are near siltstone rock formations. The comments from section 7.4 (West Area) also apply to the Northwest Area, and the slightly high readings at these four locations are due to the influence of the higher natural background radiation levels of the rock.

		AVG GAMMA	AVG BETA	AVG GAMMA	AVG BETA
		@1-m(cpm)	@1-cm(dpm)	EXPOSURE	(dpm/100cm <sup>2</sup> )
		(uR/Hr)			
NORTHWEST AREA SUMMARY	median	= 3128	866	14.5	4,331
	mean	= 3177	848	14.8	4,242
	sdev	= 205	103	1.0	517
	max	= 3954	1,037	18.4	5,185
	min	= 2798	465	13.0	2,326
	n	= 65	64	65	64
ssa based		3128	866	14.5	4,331
on northwest		+ 476	+ 241	+ 2.2	+ 1,203
area data:		= 3606	1,108	16.8	5,539
ssa based		2966	841	13.8	4,207
on total		+ 523	+ 258	+ 2.4	+ 1,291
survey data:		= 3489	1,099	16.2	5,498

Table 6-1. Statistical Summary of Northwest Area Survey Results.

Table 6-2.

Northwest Area -- Averaged Radiation Levels at Each Survey Location.

NORTHWEST AREA: Averaged Rad Level at Each Location

SDF AREA	N/S COORD	WEST COORD	D	AVG GAMMA a1-m(cpm)	AVG BETA a1-cm(dpm)	AVG GAMMA EXPOSURE (uR/Hr)	AVG BETA (dpm/100cm2)
---	---	---	?	---	---	---	---
NW	120 N	217 W		3954 !	866	18.4 !	4,331
NW	120 N	210 W		3484 !	923	16.2 !	4,613
NW	120 N	200 W		3352	899	15.6	4,497
NW	120 N	190 W		3132	845	14.6	4,227
NW	120 N	180 W		3052	888	14.2	4,442
NW	120 N	170 W	d	3133 (wet baranca)		14.6	
NW	110 N	220 W		3685 !	862	17.1 !	4,311
NW	110 N	210 W		3371	1,026	15.7	5,131
NW	110 N	200 W		3244	895	15.1	4,474
NW	110 N	190 W		3048	1,037	14.2	5,185
NW	100 N	230 W		3650 !	943	17.0 !	4,714
NW	100 N	220 W		3458	824	16.1	4,119
NW	100 N	210 W		3218	811	15.0	4,055
NW	100 N	200 W		3126	878	14.5	4,392
NW	100 N	190 W		3057	926	14.2	4,631
NW	100 N	180 W		3153	873	14.7	4,366
NW	90 N	240 W		3470	879	16.1	4,394
NW	90 N	230 W		3335	755	15.5	3,776
NW	90 N	220 W		3428	917	15.9	4,585
NW	90 N	210 W		3026	750	14.1	3,751
NW	90 N	200 W		2979	868	13.9	4,339
NW	90 N	190 W		3021	764	14.1	3,819
NW	80 N	240 W		3274	952	15.2	4,758
NW	80 N	230 W		3123	915	14.5	4,574
NW	80 N	220 W		3092	757	14.4	3,785
NW	80 N	210 W		2992	725	13.9	3,626
NW	80 N	200 W		2903	764	13.5	3,818
NW	80 N	190 W	d	(drain)			
NW	70 N	230 W		3302	846	15.4	4,228
NW	70 N	220 W		3128	733	14.5	3,667
NW	70 N	210 W		3097	716	14.4	3,578
NW	70 N	200 W		3048	812	14.2	4,059
NW	70 N	190 W	d	(drain)			
NW	60 N	230 W		3111	736	14.5	3,681
NW	60 N	220 W		3003	657	14.0	3,283
NW	60 N	210 W		3050	925	14.2	4,627
NW	60 N	200 W	d	(drain)			
NW	50 N	240 W		3245	917	15.1	4,584
NW	50 N	230 W		3140	465	14.6	2,326
NW	50 N	220 W		3142	751	14.6	3,754
NW	50 N	210 W		2868	799	13.3	3,994
NW	40 N	250 W		3406	852	15.8	4,259
NW	40 N	240 W		3258	932	15.2	4,662
NW	40 N	230 W		3237	985	15.1	4,926
NW	40 N	220 W		2798	676	13.0	3,382
NW	30 N	260 W		3204	794	14.9	3,970
NW	30 N	250 W		3185	862	14.8	4,312
NW	30 N	240 W		3300	926	15.3	4,632
NW	30 N	230 W		2953	746	13.7	3,728
NW	30 N	220 W		3018	926	14.0	4,629
NW	30 N	210 W		3009	948	14.0	4,738
NW	30 N	200 W		3025	804	14.1	4,021
NW	20 N	270 W		3341	948	15.5	4,740
NW	20 N	260 W		3140	889	14.6	4,445
NW	20 N	250 W		3079	868	14.3	4,340
NW	20 N	240 W		2859	804	13.3	4,020
NW	20 N	230 W	*	3042	930	14.1	4,650
NW	10 N	270 W		3207	922	14.9	4,608
NW	10 N	260 W		3080	916	14.3	4,580
NW	10 N	250 W		3069	704	14.3	3,518
NW	10 N	240 W		3040	746	14.1	3,729
NW	0 N	300 W		3408	991	15.9	4,953
NW	0 N	290 W		3420	996	15.9	4,980
NW	0 N	280 W		3291	990	15.3	4,952
NW	0 N	270 W		3151	841	14.7	4,207
NW	0 N	260 W		3063	698	14.2	3,489
NW	0 N	250 W		2935	947	13.7	4,737
NW	0 N	240 W		3078	756	14.3	3,779
---	---	---	---	---	---	---	---

Figure 20. Northwest Area Map of Ambient Gamma Activity.

		NORTHWEST AREA AMBIENT GAMMA ACTIVITY @ 1-m (cpm)													
		west coordinate:													
		300	290	280	270	260	250	240	230	220	210	200	190	180	170
		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
north coordinate:	120									3954	3484	3352	3132	3052	3133
	110									3685	3371	3244	3048		
	100								3650	3458	3218	3126	3057	3153	
	90							3470	3335	3428	3026	2979	3021		
	80							3274	3123	3092	2992	2903	d		
	70								3302	3128	3097	3048	d		
	60								3111	3003	3050	d			
	50							3245	3140	3142	2868				
	40					3406	3258	3237	2798						
	30				3204	3185	3300	2953	3018	3009	3025				
	20			3341	3140	3079	2859	3042							
	10			3207	3080	3069	3040								
	0	3408	3420	3291	3151	3063	2935	3078							

NORTHWEST AREA  
AMBIENT GAMMA @ 1-m  
avg cpm

-----  
median = 3128  
mean = 3177  
sdev = 205  
max = 3954  
min = 2798  
n = 65

ssa = BkGd + (523)  
= 3489 cpm

SDF SURVEY TOTAL  
AMBIENT GAMMA @ 1-m  
avg cpm

-----  
BkGd = median = 2966  
mean = 2996  
sdev = 225  
max = 5914  
min = 2097  
n = 812

\* note: Four locations with statistically significant gamma activity were found.

Figure 21. Northwest Area Map of Gamma Exposure.

		NORTHWEST AREA AMBIENT GAMMA EXPOSURE @ 1-m (uR/hr)													
		west coordinate:													
		300	290	280	270	260	250	240	230	220	210	200	190	180	170
		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
north	120									18.4	16.2	15.6	14.6	14.2	14.6
coordinate:	110									17.1	15.7	15.1	14.2		
	100								17.0	16.1	15.0	14.5	14.2	14.7	
	90							16.1	15.5	15.9	14.1	13.9	14.1		
	80							15.2	14.5	14.4	13.9	13.5	d		
	70								15.4	14.5	14.4	14.2	d		
	60								14.5	14.0	14.2	d			
	50							15.1	14.6	14.6	13.3				
	40						15.8	15.2	15.1	13.0					
	30				14.9	14.8	15.3	13.7	14.0	14.0	14.1				
	20			15.5	14.6	14.3	13.3	14.1							
	10			14.9	14.3	14.3	14.1								
	0	15.9	15.9	15.3	14.7	14.2	13.7	14.3							

NORTHWEST AREA  
GAMMA EXPOSURE @ 1-m  
uR/hr

-----  
median = 14.5  
mean = 14.8  
sdev = 1.0  
max = 18.4  
min = 13.0  
n = 65

ssa = BkGd + (2.4)  
= 16.2 uR/hr

SDF SURVEY TOTAL  
GAMMA EXPOSURE @ 1-m  
uR/hr

-----  
BkGd = median = 13.8  
mean = 13.9  
sdev = 1.0  
max = 27.5  
min = 9.8  
n = 812

\* note: Four locations with statistically significant gamma exposure were found.

Figure 22. Northwest Area Map of Surface Beta Activity.

		NORTHWEST AREA BETA ACTIVITY (dpm/100cm2)													
		west coordinate:													
		300	290	280	270	260	250	240	230	220	210	200	190	180	170
		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
north	120									4,331	4,613	4,497	4,227	4,442	d
coordinate:															
	110									4,311	5,131	4,474	5,185		
	100								4,714	4,119	4,055	4,392	4,631	4,366	
	90							4,394	3,776	4,585	3,751	4,339	3,819		
	80							4,758	4,574	3,785	3,626	3,818	d		
	70								4,228	3,667	3,578	4,059	d		
	60								3,681	3,283	4,627	d			
	50							4,584	2,326	3,754	3,994				
	40					4,259	4,662	4,926	3,382						
	30				3,970	4,312	4,632	3,728	4,629	4,738	4,021				
	20			4,740	4,445	4,340	4,020	4,650							
	10			4,608	4,580	3,518	3,729								
	0	4,953	4,980	4,952	4,207	3,489	4,737	3,779							

NORTHWEST AREA  
BETA ACTIVITY @ 1-cm  
dpm/100cm2

-----  
median = 4,331  
mean = 4,242  
sdev = 517  
max = 5,185  
min = 2,326  
n = 64

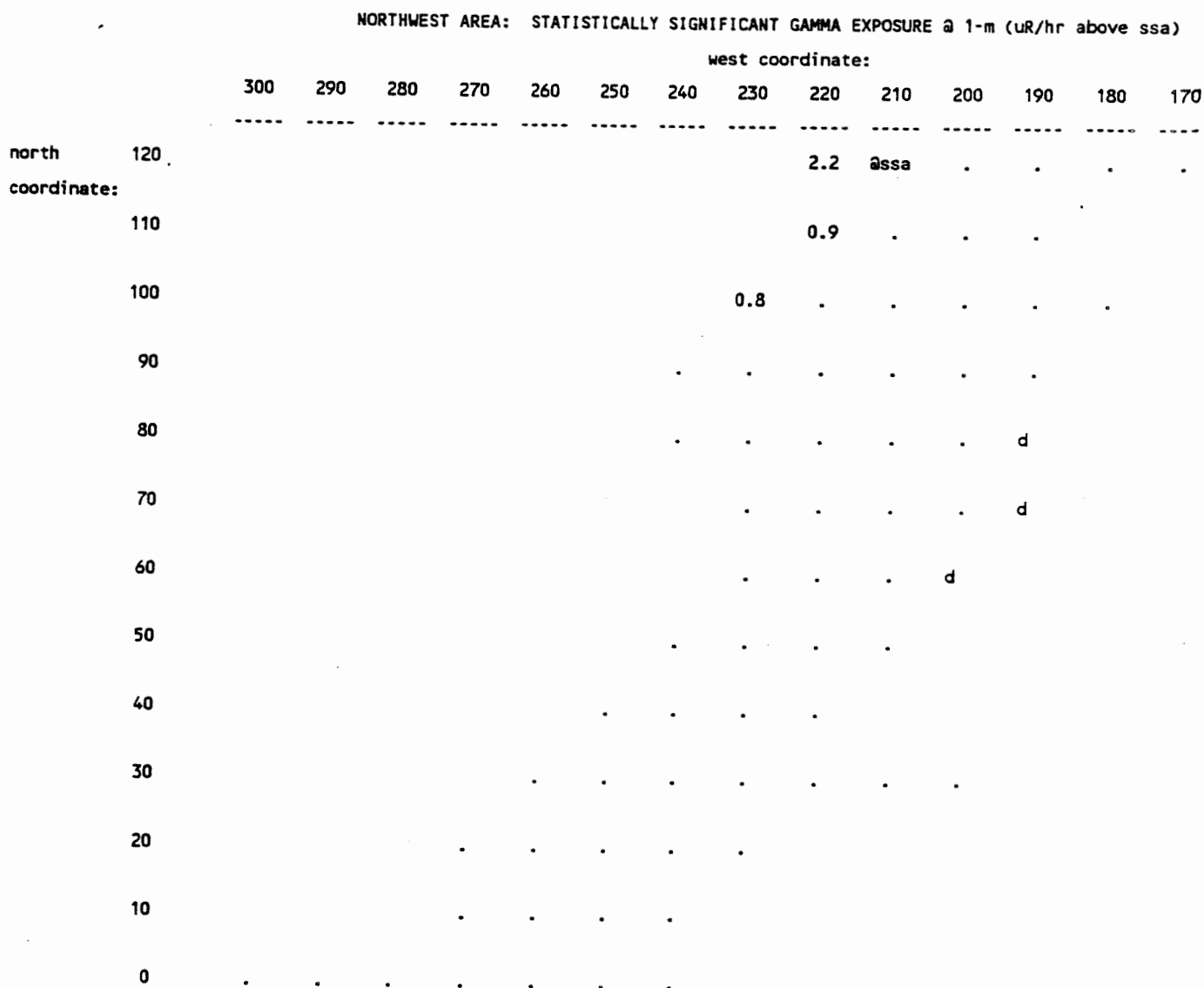
ssa = Bkgd + (1,291)  
= 5,498 dpm/100cm2

SDF SURVEY TOTAL  
BETA ACTIVITY @ 1-cm  
dpm/100cm2

-----  
Bkgd = median = 4,207  
mean = 4,200  
sdev = 555  
max = 6,215  
min = 2,326  
n = 811



Figure 23. Northwest Area Map of Locations with Statistically Significant Gamma Exposure.



NORTHWEST AREA  
GAMMA EXPOSURE @ 1-m  
uR/hr

-----  
median = 14.5  
mean = 14.8  
sdev = 1.0  
max = 18.4  
min = 13.0  
n = 65

ssa = BkGd + (2.4)  
= 16.2 uR/hr

SDF SURVEY TOTAL  
GAMMA EXPOSURE @ 1-m  
uR/hr

-----  
BkGd = median = 13.8  
mean = 13.9  
sdev = 1.0  
max = 27.5  
min = 9.8  
n = 812

\* note: Four locations with statistically significant gamma exposure were found.

**7.6 Northeast Area:** A statistical summary of the Northeast Area survey results are presented in Table 7-1. SSA values have been estimated from the Northeast Area data so the area data can be compared to the overall site data.

The averaged radiation levels for each location on the sample grid for the Northeast Area are presented in Table 7-2. The radiation levels for each 10-ft grid interval are shown in map format in Figure 24 (Gamma Activity), Figure 25 (Gamma Exposure), and Figure 26 (Beta Activity). No statistically significant ambient gamma or surface beta activity was recorded in the Northeast Area. All survey readings were indistinguishable from normal background radiation.

Five locations in the Northeast Area could not be surveyed due to obstructions.

		AVG GAMMA @1-m(cpm)	AVG BETA @1-cm(dpm)	AVG GAMMA EXPOSURE (uR/Hr)	AVG BETA (dpm/100cm <sup>2</sup> )
NORTHEAST AREA		-----	-----	-----	-----
SUMMARY	median =	2966	900	13.8	4,500
	mean =	2948	889	13.7	4,445
	sdev =	126	90	0.6	450
	max =	3188	1,075	14.8	5,373
	min =	2097	655	9.7	3,275
	n =	208	208	208	208
ssa based		2966	900	13.8	4,500
on northeast		+ 293	+ 209	+ 1.4	+ 1,047
area data: =		3259	1,109	15.2	5,547
ssa based		2966	841	13.8	4,207
on total		+ 523	+ 258	+ 2.4	+ 1,291
survey data: =		3489	1,099	16.2	5,498
---		-----	-----	-----	-----

Table 7-1. Statistical Summary of Northeast Area Survey Results.

Table 7-2. Northeast Area -- Averaged Radiation Levels at Each Survey Location.

NORTHEAST AREA: Averaged Rad Level at Each Location															
SDF AREA	N/S COORD	WEST COORD	D	AVG GAMMA a1-m(cpm)	AVG BETA a1-cm(dpm)	AVG GAMMA EXPOSURE (uR/Hr)	AVG BETA (dpm/100cm2)	SDF AREA	N/S COORD	WEST COORD	D	AVG GAMMA a1-m(cpm)	AVG BETA a1-cm(dpm)	AVG GAMMA EXPOSURE (uR/Hr)	AVG BETA (dpm/100cm2)
---	---	---	?	---	---	---	---	---	---	---	?	---	---	---	---
NE 160 N	120 W			2918	802	13.6	4,011	NE 110 N	100 W			2715	861	12.6	4,306
NE 160 N	110 W			2939	743	13.7	3,716	NE 110 N	90 W			2838	917	13.2	4,587
NE 160 N	100 W			2880	860	13.4	4,301	NE 110 N	80 W			2858	899	13.3	4,495
NE 160 N	90 W			3045	917	14.1	4,583	NE 110 N	70 W			2933	859	13.6	4,296
NE 160 N	80 W			3019	943	14.0	4,717	NE 110 N	60 W			2930	942	13.5	4,712
NE 160 N	70 W			3050	1066	14.2	5,329	NE 110 N	50 W			3005	863	14.0	4,316
NE 160 N	60 W			3018	1075	14.0	5,373	NE 110 N	40 W						
NE 160 N	50 W			3055	936	14.2	4,679	NE 100 N	170 W			2988	929	13.9	4,643
NE 160 N	40 W			2991	918	13.9	4,592	NE 100 N	160 W			3018	835	14.0	4,175
NE 160 N	30 W			2980	1008	13.9	5,039	NE 100 N	150 W			3052	906	14.2	4,532
NE 150 N	150 W			3130	938	14.5	4,691	NE 100 N	140 W			2954	981	13.7	4,906
NE 150 N	140 W			2983	845	13.9	4,226	NE 100 N	130 W			3001	792	13.9	3,962
NE 150 N	130 W			2969	880	13.8	4,399	NE 100 N	120 W			2708	916	12.5	4,580
NE 150 N	120 W			2977	745	13.8	3,723	NE 100 N	100 W			2648	976	12.3	4,878
NE 150 N	110 W			2891	918	13.4	4,589	NE 100 N	90 W			2772	855	12.9	4,276
NE 150 N	100 W			2969	771	13.8	3,854	NE 100 N	80 W			2936	779	13.6	3,894
NE 150 N	90 W			2938	1001	13.6	5,004	NE 100 N	70 W			2986	838	13.9	4,191
NE 150 N	80 W			2929	993	13.6	4,963	NE 100 N	60 W			2927	948	13.5	4,739
NE 150 N	70 W			2977	1027	13.8	5,136	NE 100 N	50 W			3081	955	14.3	4,776
NE 150 N	60 W			2960	895	13.8	4,474	NE 100 N	40 W						
NE 150 N	50 W			2929	873	13.6	4,364	NE 90 N	180 W			3105	988	14.4	4,938
NE 150 N	40 W			2994	1038	13.9	5,189	NE 90 N	170 W			2986	854	13.9	4,269
NE 140 N	150 W			3001	890	13.9	4,449	NE 90 N	160 W			2943	1049	13.7	5,247
NE 140 N	140 W			2980	940	13.8	4,700	NE 90 N	150 W			2906	967	13.5	4,836
NE 140 N	130 W			2949	806	13.7	4,032	NE 90 N	140 W			2491	839	11.6	4,195
NE 140 N	120 W			2896	784	13.5	3,921	NE 90 N	130 W			2097	1068	9.7	5,339
NE 140 N	110 W			2881	816	13.4	4,078	NE 90 N	120 W			2319	866	10.3	4,331
NE 140 N	100 W			2780	974	12.9	4,870	NE 90 N	110 W			2840	1029	13.2	5,145
NE 140 N	90 W			2833	924	13.2	4,622	NE 90 N	100 W			2927	1036	13.6	5,182
NE 140 N	80 W			2933	984	13.6	4,920	NE 90 N	90 W			2865	944	13.3	4,719
NE 140 N	70 W			2974	937	13.8	4,684	NE 90 N	80 W			2954	930	13.7	4,649
NE 140 N	60 W			2947	888	13.7	4,440	NE 90 N	70 W			2917	900	13.6	4,502
NE 140 N	50 W			2912	890	13.6	4,449	NE 90 N	60 W			3069	832	14.3	4,158
NE 140 N	40 W			2959	950	13.7	4,749	NE 90 N	50 W						
NE 130 N	160 W			3188	926	14.8	4,629	NE 80 N	180 W			3075	967	14.3	4,836
NE 130 N	150 W			2966	773	13.8	3,864	NE 80 N	170 W			3037	947	14.1	4,735
NE 130 N	140 W			2931	901	13.6	4,507	NE 80 N	160 W			2989	863	13.9	4,315
NE 130 N	130 W			2811	713	13.1	3,564	NE 80 N	150 W			3108	1045	14.4	5,224
NE 130 N	120 W			2872	894	13.3	4,472	NE 80 N	140 W			3000	866	13.9	4,331
NE 130 N	110 W			2855	815	13.3	4,076	NE 80 N	130 W			2909	971	13.5	4,855
NE 130 N	100 W			2870	856	13.3	4,278	NE 80 N	120 W			2476	995	11.5	4,977
NE 130 N	90 W			2897	821	13.5	4,106	NE 80 N	110 W			2597	900	12.1	4,500
NE 130 N	80 W			2875	933	13.4	4,663	NE 80 N	100 W			2936	978	13.6	4,891
NE 130 N	70 W			2847	916	13.2	4,578	NE 80 N	90 W			2843	781	13.2	3,903
NE 130 N	60 W			2953	902	13.7	4,509	NE 80 N	80 W			2918	942	13.6	4,709
NE 130 N	50 W			3010	974	14.0	4,867	NE 80 N	70 W			2937	973	13.6	4,864
NE 130 N	40 W			3013	970	14.0	4,850	NE 80 N	60 W			2995	730	13.9	3,651
NE 120 N	160 W			2977	743	13.8	3,714	NE 80 N	50 W						
NE 120 N	150 W			2956	694	13.7	3,469	NE 70 N	180 W			3028	916	14.1	4,581
NE 120 N	140 W			2880	786	13.4	3,928	NE 70 N	170 W			2974	765	13.8	3,826
NE 120 N	130 W			2904	815	13.5	4,076	NE 70 N	160 W			2998	788	13.9	3,942
NE 120 N	120 W			2813	868	13.1	4,340	NE 70 N	150 W			2988	924	13.9	4,622
NE 120 N	110 W			2800	980	13.0	4,901	NE 70 N	140 W			2921	925	13.6	4,627
NE 120 N	100 W			2871	924	13.3	4,618	NE 70 N	130 W			2637	897	12.3	4,486
NE 120 N	90 W			2862	956	13.3	4,781	NE 70 N	120 W			2859	908	13.3	4,541
NE 120 N	80 W			2912	932	13.5	4,659	NE 70 N	110 W			2874	830	13.4	4,149
NE 120 N	70 W			2955	950	13.7	4,749	NE 70 N	100 W			2962	1048	13.8	5,242
NE 120 N	60 W			2939	909	13.7	4,544	NE 70 N	90 W			2970	946	13.8	4,728
NE 120 N	50 W			3031	927	14.1	4,636	NE 70 N	80 W			2957	900	13.7	4,500
NE 110 N	180 W			3083	919	14.3	4,596	NE 70 N	70 W			3118	937	14.5	4,686
NE 110 N	170 W			3096	813	14.4	4,066	NE 70 N	60 W			2971	847	13.8	4,233
NE 110 N	160 W			2962	919	13.8	4,595	NE 70 N	50 W						
NE 110 N	150 W			2882	850	13.4	4,249	NE 60 N	190 W			2908	906	13.5	4,532
NE 110 N	140 W			2879	701	13.4	3,504	NE 60 N	180 W			2951	751	13.7	3,755
NE 110 N	130 W			2766	984	12.9	4,919	NE 60 N	170 W			2913	824	13.5	4,122
NE 110 N	120 W			2784	1024	12.9	5,120	NE 60 N	160 W			2900	667	13.5	3,336

Table 7-2 (cont'd). Northeast Area -- Averaged Radiation Levels at Each Survey Location.

SDF AREA	N/S COORD	WEST COORD	D	AVG GAMMA 21-m (cpm)	AVG BETA 21-m (cpm)	AVG GAMMA EXPOSURE (uR/Hr)	AVG BETA (cpm/100cm2)
			?				
NE	60 N	150 W		2982	840	13.9	4,200
NE	60 N	140 W		3006	1030	14.0	5,150
NE	60 N	130 W		3066	1021	14.2	5,104
NE	60 N	120 W		2968	1041	13.8	5,205
NE	60 N	110 W		3009	804	14.0	4,018
NE	60 N	100 W		2939	917	13.7	4,583
NE	60 N	90 W		2900	918	13.5	4,590
NE	60 N	80 W		2975	908	13.8	4,541
NE	60 N	70 W		3061	1017	14.2	5,085
NE	60 N	60 W		2973	901	13.8	4,506
NE	60 N	50 W	*	2823	657	13.1	3,283
NE	50 N	200 W		3040	910	14.1	4,551
NE	50 N	190 W		2836	873	13.2	4,367
NE	50 N	180 W	*	3063	1108	14.2	5,540
NE	50 N	170 W		3099	655	14.4	3,275
NE	50 N	160 W		3009	868	14.0	4,341
NE	50 N	150 W		2932	793	13.6	3,967
NE	50 N	140 W		3114	762	14.5	3,810
NE	50 N	130 W	*	3127	901	14.5	4,503
NE	50 N	120 W		3038	889	14.1	4,445
NE	50 N	110 W		3123	890	14.5	4,448
NE	50 N	100 W		3021	836	14.0	4,180
NE	50 N	50 W		2907	668	13.5	3,340
NE	50 N	40 W		2903	670	13.5	3,349
NE	40 N	210 W	*	3060	847	14.2	4,236
NE	40 N	200 W		2992	713	13.9	3,566
NE	40 N	190 W		2929	883	13.6	4,417
NE	40 N	180 W		2977	926	13.8	4,632
NE	40 N	170 W		2988	852	13.9	4,260
NE	40 N	160 W		2980	735	13.8	3,675
NE	40 N	150 W		2970	820	13.8	4,100
NE	40 N	140 W		3045	730	14.1	3,650
NE	40 N	130 W		2936	911	13.6	4,554
NE	40 N	120 W		3038	991	14.1	4,953
NE	40 N	110 W		3012	964	14.0	4,819
NE	40 N	100 W		3115	958	14.5	4,792
NE	30 N	170 W		2941	724	13.7	3,621
NE	30 N	160 W		2926	808	13.6	4,039
NE	30 N	150 W		3011	868	14.0	4,340
NE	30 N	140 W		3051	889	14.2	4,446
NE	30 N	130 W		2988	883	13.9	4,417
NE	30 N	120 W		3070	889	14.3	4,447
NE	30 N	110 W		3045	895	14.1	4,474
NE	30 N	100 W		3134	922	14.6	4,612
NE	20 N	160 W		3037	868	14.1	4,340
NE	20 N	150 W		2938	793	13.7	3,967
NE	20 N	140 W		2987	815	13.9	4,073
NE	20 N	130 W		2982	921	13.9	4,605
NE	20 N	120 W		3002	873	13.9	4,367
NE	20 N	110 W		2962	916	13.8	4,581
NE	20 N	100 W		3099	894	14.4	4,471
NE	10 N	140 W		2964	873	13.8	4,365
NE	10 N	130 W		2983	895	13.9	4,477
NE	10 N	120 W		3012	953	14.0	4,765
NE	10 N	110 W		3060	943	14.2	4,713
NE	10 N	100 W		3082	948	14.3	4,741
NE	0 N	140 W		2996	745	13.9	3,727
NE	0 N	130 W		3115	911	14.5	4,557
NE	0 N	120 W		3009	954	14.0	4,769
NE	0 N	110 W		3042	857	14.1	4,287
NE	0 N	100 W		2965	1044	13.8	5,221
NE	10 S	130 W		2894	1011	13.4	5,057
NE	10 S	120 W		3041	825	14.1	4,127
NE	10 S	110 W		2995	975	13.9	4,873
NE	10 S	100 W		2964	974	13.8	4,871
NE	10 S	90 W		2988	959	13.9	4,793
NE	20 S	130 W		2918	698	13.6	3,489
NE	20 S	120 W		2975	772	13.8	3,861
NE	20 S	110 W		2981	783	13.9	3,914
NE	20 S	100 W		2914	868	13.5	4,341
NE	30 S	120 W		3002	841	13.9	4,206
NE	30 S	110 W		3040	820	14.1	4,102
NE	30 S	100 W		3028	990	14.1	4,951
NE	40 S	120 W		3079	868	14.3	4,341
NE	40 S	110 W		2880	788	13.4	3,942
NE	40 S	100 W		2932	884	13.6	4,420
NE	40 S	90 W		2872	889	13.3	4,446
NE	50 S	120 W	*	3093	991	14.4	4,956
NE	50 S	110 W	*	2916	744	13.6	3,720
NE	50 S	100 W	*	2931	942	13.6	4,712
NE	50 S	90 W	*	2920	891	13.6	4,457

Figure 24. Northeast Area Map of Ambient Gamma Activity.

NORTHEAST AREA AMBIENT GAMMA ACTIVITY @ 1-m (avg cpm)

north/south coordinate:	west coordinate:																	
	210	200	190	180	170	160	150	140	130	120	110	100	90	80	70	60	50	40
160										2918	2939	2880	3045	3019	3050	3018	3055	2991
150							3130	2983	2969	2977	2891	2969	2938	2929	2977	2960	2929	2994
140							3001	2980	2949	2896	2881	2780	2833	2933	2974	2947	2912	2959
130							3188	2966	2931	2811	2872	2855	2870	2897	2875	2847	2953	3010
120							2977	2956	2880	2904	2813	2800	2871	2862	2912	2955	2939	3031
110				3083	3096	2962	2882	2879	2766	2784	obs	2715	2838	2858	2933	2930	3005	
100					2988	3018	3052	2954	3001	2708	obs	2648	2772	2936	2986	2927	3081	
90				3105	2986	2943	2906	2491	2097	2319	2840	2927	2865	2954	2917	obs	3069	
80				3075	3037	2989	3108	3000	2909	obs	2476	2597	2936	2843	2918	2937	2995	
70				3028	2974	2998	2988	obs	2921	2637	2859	2874	2962	2970	2957	3118	2971	
60			2908	2951	2913	2900	2982	3006	3066	2968	3009	2939	2900	2975	3061	2973	2823	
50		3040	2836	3061	3099	3009	2932	3114	3127	3038	3123	3021					2907	2903
40	3060	2992	2929	2977	2988	2980	2970	3045	2936	3038	3012	3115						
30					2941	2926	3011	3051	2988	3070	3045	3134						
20							3037	2938	2987	2982	3002	2962	3099					
10																		
0																		
-10																		
-20																		
-30																		
-40																		
-50																		

.....  
: TOTAL SDF SURVEY :  
: AMBIENT GAMMA @ 1-m :  
: (avg cpm) :  
: ----- :  
: median = 2966 :  
: mean = 2996 :  
: sdev = 225 :  
: max = 5914 :  
: min = 2097 :  
: n = 812 :  
:.....

Figure 25. Northeast Area Map of Gamma Exposure.

## NORTHEAST AREA AMBIENT GAMMA EXPOSURE @ 1-m (avg uR/hr)

north/south coordinate:	west coordinate:																	
	210	200	190	180	170	160	150	140	130	120	110	100	90	80	70	60	50	40
160										13.6	13.7	13.4	14.1	14.0	14.2	14.0	14.2	13.9
150							14.5	13.9	13.8	13.8	13.4	13.8	13.6	13.6	13.8	13.8	13.6	13.9
140							13.9	13.8	13.7	13.5	13.4	12.9	13.2	13.6	13.8	13.7	13.6	13.7
130						14.8	13.8	13.6	13.1	13.3	13.3	13.3	13.5	13.4	13.2	13.7	14.0	14.0
120						13.8	13.7	13.4	13.5	13.1	13.0	13.3	13.3	13.5	13.7	13.7	14.1	
110			14.3	14.4	13.8	13.4	13.4	12.9	12.9	obs	12.6	13.2	13.3	13.6	13.6	14.0		
100				13.9	14.0	14.2	13.7	13.9	12.6	obs	12.3	12.9	13.6	13.9	13.6	14.3		
90			14.4	13.9	13.7	13.5	11.6	9.7	10.8	13.2	13.6	13.3	13.7	13.6	obs	14.3		
80			14.3	14.1	13.9	14.4	13.9	13.5	obs	11.5	12.1	13.6	13.2	13.6	13.6	13.9		
70			14.1	13.8	13.9	13.9	obs	13.6	12.3	13.3	13.4	13.8	13.8	13.7	14.5	13.8		
60		13.5	13.7	13.5	13.5	13.9	14.0	14.2	13.8	14.0	13.7	13.5	13.8	14.2	13.8	13.1		
50		14.1	13.2	14.2	14.4	14.0	13.6	14.5	14.5	14.1	14.5	14.0					13.5	13.5
40	14.2	13.9	13.6	13.8	13.9	13.8	13.8	14.1	13.6	14.1	14.0	14.5						
30				13.7	13.6	14.0	14.2	13.9	14.3	14.1	14.6							
20						14.1	13.7	13.9	13.9	13.9	13.8	14.4						
10								13.8	13.9	14.0	14.2	14.3						
(-n=south) 0								13.9	14.5	14.0	14.1	13.8						
-10																		
-20																		
-30																		
-40																		
-50																		

: TOTAL SDF SURVEY :
: AMBIENT GAMMA EXPOSURE:
: @ 1-m (avg uR/hr) :
: ----- :
: median = 13.8 :
: mean = 13.9 :
: sdev = 1.0 :
: max = 27.5 :
: min = 9.8 :
: n = 812 :
: ----- :
: ssa = Bkgd + (2.4) :
: = 16.2 uR/hr :
: ----- :

Figure 26. Northeast Area Map of Surface Beta Activity.

		NORTHEAST AREA BETA ACTIVITY @ 1-cm (dpm/100cm2)																	
		west coordinate:																	
north/south coordinate:		210	200	190	180	170	160	150	140	130	120	110	100	90	80	70	60	50	40
	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
160												4,011	3,716	4,301	4,583	4,717	5,329	5,373	4,679 4,592
150									4,691	4,226	4,399	3,723	4,589	3,854	5,004	4,963	5,136	4,474	4,364 5,189
140									4,449	4,700	4,032	3,921	4,078	4,870	4,622	4,920	4,684	4,440	4,449 4,749
130									4,629	3,864	4,507	3,564	4,472	4,076	4,278	4,106	4,663	4,578	4,509 4,867 4,850
120									3,714	3,469	3,928	4,076	4,340	4,901	4,618	4,781	4,659	4,749	4,544 4,636
110																			
100																			
90																			
80																			
70																			
60																			
50																			
40																			
30																			
20																			
10																			
(-n=south) 0																			
-10																			
-20																			
-30																			
-40																			
-50																			

**7.7. East Area:** A statistical summary of the East Area survey results are presented in Table 8-1. SSA values have been estimated from the East Area data so the area data can be compared to the overall site data.

The averaged radiation levels for each location on the sample grid for the East Area are presented in Table 8-2. The radiation levels for each 10-ft grid interval are shown in map format in Figure 27 (Gamma Activity), Figure 28 (Gamma Exposure), and Figure 29 (Beta Activity). No statistically significant ambient gamma or surface beta activity was recorded in the East Area. All survey readings were indistinguishable from normal background radiation.

		AVG GAMMA	AVG BETA	AVG GAMMA	AVG BETA
		@1-m(cpm)	@1-cm(dpm)	EXPOSURE	(dpm/100cm <sup>2</sup> )
				(uR/Hr)	
EAST					
AREA	median	= 2911	887	13.5	4,435
SUMMARY	mean	= 2873	874	13.4	4,368
	sdev	= 117	126	0.5	632
	max	= 3061	1,078	14.2	5,390
	min	= 2498	629	11.6	3,144
	n	= 33	33	33	33
		-----	-----	-----	-----
ssa based		2911	887	13.5	4,435
on east		+ 273	+ 294	+ 1.3	+ 1,472
area data:	=	3184	1,181	14.8	5,906
		-----	-----	-----	-----
ssa based	Bkgd=	2966	841	13.8	4,207
on total		+ 523	+ 258	+ 2.4	+ 1291
survey data:	=	3489	1,099	16.2	5,498
		-----	-----	-----	-----

Table 8-1. Statistical Summary of East Area Survey Results.



Table 8-2. East Area -- Averaged Radiation Levels at Each Survey Location.

SDF BASELINE beta/gamma SURVEY: AVERAGE 10-FT GRID ACTIVITY:

EAST AREA: Averaged Rad Level at Each Location

SDF AREA	N/S COORD	WEST COORD	D	AVG GAMMA	AVG BETA	AVG GAMMA	AVG BETA
				a1-m(cpm)	a1-cm(dpm)	EXPOSURE (uR/Hr)	(dpm/100cm2)
---	---	---	?	-----	-----	-----	-----
E	60 S	120 W		2975	1,039	13.8	5,193
E	60 S	110 W		2914	937	13.6	4,687
E	60 S	100 W		2796	1,008	13.0	5,041
E	70 S	110 W		2967	1,078	13.8	5,390
E	70 S	100 W		2917	983	13.6	4,914
E	70 S	90 W		2663	961	12.4	4,807
E	80 S	120 W		2973	811	13.8	4,053
E	80 S	110 W	*	3061	1,077	14.2	5,383
E	80 S	100 W		2836	1,070	13.2	5,351
E	80 S	90 W		2498	875	11.6	4,377
E	80 S	80 W		2630	923	12.2	4,613
E	90 S	110 W	*	3056	982	14.2	4,909
E	90 S	100 W		2810	866	13.1	4,331
E	90 S	90 W		2748	890	12.8	4,452
E	90 S	80 W		2723	995	12.7	4,974
E	100 S	100 W		2860	771	13.3	3,854
E	100 S	90 W		2915	792	13.6	3,958
E	100 S	80 W		2924	887	13.6	4,435
E	110 S	100 W		2911	863	13.5	4,315
E	110 S	90 W		2970	961	13.8	4,806
E	110 S	80 W		2936	810	13.7	4,050
E	120 S	100 W		2942	734	13.7	3,670
E	120 S	90 W		2957	925	13.8	4,627
E	120 S	80 W		2980	976	13.9	4,878
E	130 S	100 W		2917	669	13.6	3,343
E	130 S	90 W		2916	782	13.6	3,909
E	130 S	80 W		2911	830	13.5	4,150
E	130 S	70 W		2782	891	12.9	4,453
E	140 S	100 W		2837	663	13.2	3,313
E	140 S	90 W		2895	629	13.5	3,144
E	140 S	80 W		2857	801	13.3	4,006
E	140 S	70 W		2850	652	13.3	3,260
E	150 S	100 W		2883	699	13.4	3,494
---	---	---	---	-----	-----	-----	-----

Figure 27. East Area Map of Ambient Gamma Activity.

		EAST AREA AMBIENT GAMMA @ 1-m (cpm)					
		west coordinate:					
		120	110	100	90	80	70
		-----	-----	-----	-----	-----	-----
south coordinate:	-60	2975	2914	2796			
	-70		2967	2917	2663		
	-80	2973	3061	2836	2498	2630	
	-90		3056	2810	2748	2723	
	-100			2860	2915	2924	
	-110			2911	2970	2936	
	-120			2942	2957	2980	
	-130			2917	2916	2911	2782
	-140			2837	2895	2857	2850
	-150			2883			

EAST AREA  
GAMMA ACTIVITY  
@ 1-m (cpm)  
-----  
median = 2911  
mean = 2873  
sdev = 117  
max = 3061  
min = 2498  
n = 33

TOTAL SDF SURVEY  
GAMMA ACTIVITY  
@ 1-m (cpm)  
-----  
median = 2966  
mean = 2996  
sdev = 225  
max = 5914  
min = 2097  
n = 812

$$\text{ssa} = 8\text{kgd} + (523) \\ = 3489\text{cpm}$$

Figure 28. East Area Map of Gamma Exposure.

		EAST AREA AMBIENT GAMMA EXPOSURE @ 1-m (uR/hr)					
		west coordinate:					
		120	110	100	90	80	70
		-----	-----	-----	-----	-----	-----
south coordinate:	-60	13.8	13.6	13.0			
	-70		13.8	13.6	12.4		
	-80	13.8	14.2	13.2	11.6	12.2	
	-90		14.2	13.1	12.8	12.7	
	-100			13.3	13.6	13.6	
	-110			13.5	13.8	13.7	
	-120			13.7	13.8	13.9	
	-130			13.6	13.6	13.5	12.9
	-140			13.2	13.5	13.3	13.3
	-150			13.4			

EAST AREA  
GAMMA EXPOSURE  
@ 1-m (uR/hr)  
-----  
median = 13.5  
mean = 13.4  
sdev = 0.5  
max = 14.2  
min = 11.6  
n = 33

TOTAL SDF SURVEY  
GAMMA EXPOSURE  
@ 1-m (uR/hr)  
-----  
median = 13.8  
mean = 13.9  
sdev = 1.0  
max = 27.5  
min = 9.8  
n = 812

$$\begin{aligned} \text{ssa} &= 8\text{kGd} + (2.4) \\ &= 16.2 \text{ uR/hr} \end{aligned}$$

Figure 29. East Area Map of Surface Beta Activity.

		EAST AREA BETA ACTIVITY @ 1-cm (dpm/100cm2)					
		west coordinate:					
		120	110	100	90	80	70
		-----	-----	-----	-----	-----	-----
south coordinate:	-60	5,193	4,687	5,041			
	-70		5,390	4,914	4,807		
	-80	4,053	5,383	5,351	4,377	4,613	
	-90		4,909	4,331	4,452	4,974	
	-100			3,854	3,958	4,435	
	-110			4,315	4,806	4,050	
	-120			3,670	4,627	4,878	
	-130			3,343	3,909	4,150	4,453
	-140			3,313	3,144	4,006	3,260
	-150			3,494			

EAST AREA  
BETA ACTIVITY  
@ 1-cm (dpm/100cm2)  
-----  
median = 4,435  
mean = 4,368  
sdev = 632  
max = 5,390  
min = 3,144  
n = 33

TOTAL SDF SURVEY  
BETA ACTIVITY  
@ 1-cm (dpm/100cm2)  
-----  
median = 4,207  
mean = 4,200  
sdev = 555  
max = 6,215  
min = 2,325  
n = 811

$$\begin{aligned} \text{ssa} &= \text{BkGd} + (1,291) \\ &= 5498 \text{ dpm/100cm2} \end{aligned}$$

### 8. References

1. "Preliminary beta/gamma Radiological Survey and Data Analysis for the Sodium Disposal Facility Closure"; 13 Feb 92; J.Collins; ETEC 886-ZB-0003.
2. "Radiological Survey of the Sodium Disposal Facility -- Bldg T886"; 3 June 88; J.Chapman; ETEC GEN-ZR-0004.
3. "Investigation of Naturally Occurring Radionuclides In Rock, Soils, and Groundwater [at the] Santa Susana Field Laboratory, Ventura County, California"; 1 June 90; Groundwater Resources Consultants, Inc; 8640M-77.